

[No. 20]

CIVIL DEFENSE—FALLOUT SHELTER  
PROGRAM

HEARINGS

BEFORE

SUBCOMMITTEE NO. 3

COMMITTEE ON ARMED SERVICES

HOUSE OF REPRESENTATIVES

EIGHTY-EIGHTH CONGRESS

FIRST SESSION

PURSUANT TO

H.R. 3516

TO FURTHER AMEND THE FEDERAL CIVIL DEFENSE ACT  
OF 1950, AS AMENDED, TO PROVIDE FOR SHELTER IN FED-  
ERAL STRUCTURES, TO AUTHORIZE PAYMENT TOWARD  
THE CONSTRUCTION OR MODIFICATION OF APPROVED  
PUBLIC SHELTER SPACE, AND FOR OTHER PURPOSES

JUNE 3, 4, 5, 6, 10, 11, 12, 17, 21, 24, 25, 26, 27, JULY 10, 11, 17, 18,  
19, 23, AND 31, 1963

Part II (Volume 2)



Printed for the Committee on Armed Services

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..... AMERICAN MANAGEMENT BULLETIN | NUMBER 15

## Survival and Recovery

*Industrial Preparedness  
In the Nuclear Age*

..... AMERICAN MANAGEMENT ASSOCIATION

4731

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AMA Management Bulletins are issued to members from time to time as a means of making available, to one or more divisions, material of special interest or timeliness. *Survival and Recovery: Industrial Preparedness in the Nuclear Age* is based upon material presented at the Special Industrial Preparedness Conference held in New York City January 31-February 2, 1962. It has been distributed as a service to members of the General Management Division.

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## Operation How-To

**Don G. Mitchell**

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**W**E HAVE ALL HEARD A GREAT DEAL ABOUT the perils that confront us. We know the destructive capability of nuclear weapons. We possess this capability, and so does the Soviet Union. In a matter of time others—including Red China—will possess this frightening ability to destroy.

The Communists have one advantage, however. They know we will never drop the bomb except in retaliation. This situation leaves America at the mercy of the Communist world psychologically. They know we won't drop the bomb. We hope they won't, but we must be prepared to reply in kind. Between this vast void of attack and retaliation is the world today, a world governed by a situation over which the greatest power in the world, the United States of America, has little or no control—not yet at least.

Just review the past 15 years. For the free world this period has been a succession of big and little crises, nearly all of them manufactured or aggravated by the Soviet Union, Red China, or their agents. Each new crisis finds us unprepared and astonished anew. Though we treat each as an isolated bit of trouble, each and every one is part of the long-term Communist plan for world conquest. The Communist line is not a strategy of *war*. It is clearly a strategy of *crisis*—designed to keep the free world off balance and especially to put the average American in a defensive and reactive frame of

mind. The Communists would want us to think that the choices we have are those *offered* to us and *only* those. However, we have a number of choices, and they are of our own choosing. The "Red or dead" philosophy has no place here.

Too many of us have adopted a defensive attitude. We talk about survival, and immediately everyone conjures up a picture of survival *after* the bomb is dropped. I look at it differently. We, as American business men, have a duty and obligation to help our country to survive the threat and prevent any catastrophe, the least of which is the bomb, without our losing our heritage of freedom for all who want it and without unwittingly submitting to Communist strategy.

A totally defensive attitude could dump this country into a catastrophe which would be even more unbearable than a nuclear holocaust. We could feverishly prepare for total defense and in so doing drain our resources, cripple our economy, dim our courage, and stand hopelessly by in our underground shelters as one Communist after another twists our motives and tosses them back in our astonished faces.

We must stop being so defensive and fight for the minds of men the way we fight a war—determined, united, and energetic. Every nation in the world respects a fighting American. Our history is full of the unbelievable deeds performed by Americans under arms. The battlefields of the world are covered with white crosses

to remind everyone that Americans are not without valor even in the darkest of situations.

If we accept the theory that sooner or later Russia or Red China is going to drop the bomb wholesale—and nothing could please the Communist world more—by all means let's get underground. Let's go all out for civilian defense; divert all public and private funds to digging deep, deep holes; shift our population to unlikely target areas; and direct our entire national effort to one goal—total preparedness.

It is inconceivable that the Communist world would let us proceed with this type of program. The Communists would exert every effort to disrupt and divide us as a nation, and they would undoubtedly view our defensive steps as a threat to world peace. Before we knew what was happening, we would be in the middle of the very thing we were trying to avoid—all-out nuclear war. Even if our defensive action did not touch off a nuclear war, there is no evidence that the American economy, good as it is, could withstand the strain of total preparedness. Besides, we would still possess the frightening capability of nuclear attack. The situation would be little changed, except perhaps that both sides by then would have developed newer weapons which could destroy people even underground. It's a possibility.

In other words, what we as a nation are doing today is treating the effect and devoting very little of our energy to the cause. There isn't a successful business man today who doesn't work to eliminate the cause of his industrial troubles. Domestic preparedness, or the need for it, is an effect. The world situation today, the bomb included, is the cause. If we as business men can help change the world situation, preparedness will soon be put into its proper place in our lives. This does not mean that we should be unprepared, but only that we must put preparedness into proper balance in our society.

No one is ever totally prepared. Everyone assumes calculated risks every day. Every decision we make involves a risk. We would be bankrupt if we tried to be totally prepared for every eventuality. We must weigh just how far we can go in any situation. In short, we can't

make everything absolutely fireproof but we can—without wrecking our production capabilities and alienating all our customers—put on a pretty effective fire prevention program which reduces the risk to a reasonable level.

Let's change the record and allow the free world to call the tune. Let's hit the Communist weak spots again and again and again. Let's tell the world, not by words but by deeds, that we, not the Russians, are the original revolutionists, the real champions of freedom, the true protectors of human dignity. The Federal Government wants our help in this great struggle. Our diplomats have their hands full, and the military services are on their toes 24 hours a day, ready for any eventuality. American business men should contribute a great deal in this struggle.

For one thing, we must proceed with reasonableness to prepare our companies for survival. We have no adequately coordinated national plan for industrial preparedness, and different companies in the same community have different requirements and needs. The program must be founded on knowledge and not on instinct or emotion. Each of us can, and must, proceed as our individual situations dictate.

Moreover, we can pull together in a gigantic step to export—to the new nations of the world—the one commodity that no one on earth knows better: *the scientific art of managing a successful free enterprise*. We can show them the potential rewards from such a system for investors, managers, the people who produce the goods, and the people who distribute and sell the products.

I propose here and now that every business manager in our nation band together in a fraternity of goodwill to export to the new and still-free nations of the world our accumulated skills, our principles, our knowledge, and our understanding of how the free enterprise system works for the good of all.

I propose that American business men undertake this task without financial help from our Government, as a means of showing the world that we are willing to make available to all who cherish freedom the 200 years of knowledge we have acquired in developing our com-



petitive free enterprise system into the great institution it is today.

This is not a new departure in foreign affairs. It will not interfere with our diplomatic relations, policies, or plans. Instead, it will supplement administration efforts with a direct "business man to business man" contact in the new nations. It would have a people-to-people appeal. Its self-help motivation would be very attractive to the business communities of new nations. Such a program would have five major objectives:

1. It would make available to the business leaders of developing countries our vast reservoir of practical management know-how.
2. It would emphasize the advantages of the free enterprise system in improving the competitive production of goods and services—without, also, sacrificing human rights and values in the process.
3. It would help create groups of management practitioners armed with proven methods and skills so that such know-how could be disseminated on a do-it-yourself basis.
4. It would establish a communications system whereby business leaders in the free world could exchange new ideas

and practices for the mutual benefit of all.

5. It would provide for an annual exchange of thinking among free-world business leaders to assure cross-fertilization of ideas and effective feedback of results.

Our business leaders must undertake this challenge and pursue it to every corner of the world. We must let these new business men know their stake in this world struggle, and we must act now to help them help themselves, their governments, and their fellow citizens. The free enterprise system—based on hard work, quality, open competition, and just rewards for all who participate—is a sure winner in any ideological struggle with Communism. We must exert every effort to show these developing nations that our system is the best way to achieve a rising economy without sacrificing human values and individual integrity in the process.

The need for constructive action is compelling, and we, as American business men, should regard this as the start of the program. It follows that it is the responsibility of the Federal Government to offer whatever encouragement and cooperation is necessary so that this "Operation How-To" can be launched as a truly all-American-management offensive.

## A Positive Attitude Toward Survival

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WE HAVE ALL HEARD A GREAT DEAL LATELY about the postattack problems connected with nuclear warfare. This new emphasis on the postattack period means that we have begun to move, mentally and psychologically, into the last phase of what now seems to be our utter—and perhaps eventually fatal—preoccupation with the bomb. If we think back, we will be able to identify the various phases of this preoccupation, which has grown more intense with each passing year since 1945, when we dropped the first atomic bomb on Hiroshima.

In the first phase we had the bomb and Russia did not. We felt a little guilty about the great power we held, but we were satisfied that our monopoly enabled us to keep the peace. We also felt almost entirely safe from sudden attack from abroad. We might call this the *monopoly* phase.

Then Russia also got the bomb, and we began to worry about the possibility that she would use it on us. Our answer to this threat was to make sure that we had enough retaliatory atomic power to make it too costly for Russia to attack us, and we moved into the *power-deterrent* phase.

With the launching of the first Sputnik and subsequent Russian advances in space and atomic development, we entered still another phase of our preoccupation with the bomb. We might call this the *shelter* phase. We were not

so sure that we were far enough ahead of Russia—or even whether we were ahead at all—to keep her from attacking us. So we decided to dig.

We are, of course, still in both the power-deterrent and the shelter phases of our life with the bomb. They are considered by some as being two distinct philosophical approaches to the problem, although from a practical viewpoint it would seem that they supplement each other.

Yet even as these two phases hold the center of the stage, a whole new area of thought, related to the shelter phase but an entity in itself, has begun to move to the forefront. This is the *postattack* phase. Its main premise is that even if the Russians do drop thermonuclear bombs on us, we *can* survive as a nation. Not only have we learned to live with the idea of the existence of the bomb, but we are learning to live with the idea of *having it dropped on us*. This is progress indeed—if you want to look at it that way.

In his book, *On Thermonuclear War*, Herman Kahn, who perhaps more than anyone else has come to be known as the prophet of the “we *can* survive” school of thought, makes the point that through proper preparations we could cut the number of casualties from an atomic attack in half: we would have only 40 million to bury instead of 80 million. He also points out, as others are now doing with increas-



ing frequency, that the number of survivors can depend on the technique of attack used by the enemy. If he attacks military targets primarily, that is one thing. If he attacks industrial centers, that is another. If he uses air bursts, there will be more blast and less radiation. If he uses ground bursts, there will be more radiation. And so on.

Since it took Mr. Kahn 651 pages to discuss the possible variations of thermonuclear attack and since we have already heard much about these aspects of the problems, this discussion will not touch on the technical aspects of nuclear survival. Suffice it to say that there seems to be evidence that a certain number of us do have a good chance of surviving a thermonuclear attack with proper preparation and planning, and we have a good chance of carrying on in the postattack world—again with proper preparation and planning.

Recognizing that the problem of attack and survival is a vastly complicated one, nothing we can do can absolutely insure survival of our people and of our organizations. There is very little we could do that would make survival possible, for example, in the case of a direct hit or even in the case of a near miss. However, there are some things we can do that could serve us well in the case of an attack, and we can certainly do more than we are doing. As we all know, American business in general has done pitifully little to prepare for a thermonuclear war.

### **The Protection of Personnel**

One of the first and most obvious things we can do is to begin construction of adequate group shelters for our employees and their families. In a comprehensive survey of the problems of thermonuclear war, the McGraw-Hill Publishing Company found that only one out of four companies is making plans to construct a shelter to protect its personnel. Out of the 1,000 companies surveyed, only 2.5 per cent reported that they actually had shelters; 5 per cent said they had shelters in the planning stage; and some 15 per cent reported they

had shelter plans under consideration. These are shocking figures when we consider that an adequate plant shelter might mean the difference between death and survival not only for the people who have put their trust in us but for our company and perhaps our entire industry, depending on the size of our share of the market.

An adequate shelter program can also have a strong positive effect on the morale of employees—not at some hypothetical future date when the bomb is dropped but *now*. Morale cannot help but be lifted when employees see that we are making their future safety our business and are spending time, money, and energy to insure it.

Morale can be raised in shelter life, as has been done in Sweden, by using color and design extensively to make shelters brighter. It is also influenced by such factors as the amount of space available to the individual; the setting of a schedule for regular chores; providing entertainment and spiritual guidance; keeping families together; and taking action in cases of hysteria and panic.

The military services long ago discovered that the soldier who knows what is going on and is psychologically prepared and professionally trained is the soldier who is least likely to panic when faced with an emergency. So it is a basic requirement in sustaining and raising employee morale, as well as in preparing for a nuclear emergency, that we keep our employees informed as to the nature of the atomic threat and our preparations to meet it.

The facts are that most business men, far from being prepared to enlighten their employees, hardly know enough about the nature of the thermonuclear threat themselves. According to the McGraw-Hill report, when asked whether the passage of fallout made the air itself radioactive, 69 per cent of the executives queried answered incorrectly that it did, and 14 per cent admitted that they did not know. When asked at what distance from the blast a person could get second-degree burns, 73 per cent answered incorrectly, and 17 per cent said that they did not know. Again these are figures that are cause for serious concern.

Other evidences of planning and prepar-

ing for a possible attack will also pay dividends in improved employee morale now. Such preparation should include arrangements for running the shelters once they are occupied; health precautions and medical preparations; and well-developed procedures for maintaining and carrying out communications, rescue measures, security, radiological detection, and transportation operations.

### Survival of the Organization

Besides taking steps to foster the physical and psychological welfare of his employees, a business man must look to the survival of his organization. This involves making plans for the maintenance of a supply of skilled leaders. A company, as we all know, will not survive long without competent leadership.

Two suggestions could be made in this regard. The first is what I call adopting a "Noah's Ark" policy, and it entails sending executives to some foreign branch plant where they will not only get training for future leadership but be more likely to survive to fight and work another day in case first-line men are lost in an attack.

Another suggestion would be to teach men to be generalists rather than specialists. In the manner of baseball manager Casey Stengel, a firm believer in the theory that a man is more valuable if he can play several positions, we should make sure our top men, or top-men-to-be, will be ready to step into any one of several jobs in case we must face up to a postattack world.

### Phase Five: Waging Peace

We may never have to face up to a post-attack world, or even to an attack, if we can successfully pursue the fifth approach to the problem of nuclear war, which involves neither all-powerful deterrence potential nor a vast system of defense shelters. This does not mean that we should not draw on our resources to the

maximum to make sure that we are militarily superior to the Russians: we must remain strong and get stronger. Nor does this imply belittling the idea of shelters, especially group or mass shelters. One big punch is usually not enough to win a fight. We must be able to take a punch, too, and come back with a counter-punch.

What I am saying is that we must not let all this present furor over the preparation for a nuclear war blind us to the fact that there may very well be another, better way out: *to wage and win the peace*. As former President Eisenhower put it: "The only answer to a regime that wages total war is to wage total peace."

Waging total peace means, primarily, refusing to accept the theory that a nuclear war is inevitable and working with all our will, strength, and energy to make sure such a war never comes about. This can be done by making this country so strong economically and so just and admirable ideologically that the world cannot help but swing to capitalism and democracy and force communism to recede behind the borders of Russia. Such a sweeping program means making democracy and capitalism work both at home and abroad—goals which cannot possibly be achieved without the all-out support and participation of American business.

Yet too many of us fail to realize this. We do not see the goals to begin with; we do not recognize the infinite rewards for business, for our country, and for the whole free world in terms of peace and prosperity. But, most of all, we fail to accept the principles, adopt the policies, and take the actions that could lead to these goals and rewards.

We do this because we are hampered by what might be called a *shelter psychology*. This entirely negative response to the factors and truths of a changing world is not to be confused with the *policy of building shelters*, which, after all, has its positive aspects in that a shelter program could insure the nation's survival. The shelter-bound psychology means hiding under several layers of traditions and prejudices in order to escape what some of us consider to be the deadly fallout from new ideas, new situa-



tions, and new opportunities. Such a negative approach to the problems and situations of today's world, far from protecting those who hold to it, would more than likely result in our being buried alive by the swift passage of events.

This is especially so today, for never before in history has it been so important and so necessary for American business men to come out of their mental and psychological shelters, open their eyes and their minds, and throw away the irons of tradition that keep them from taking advantage of promising new situations, especially on the international scene.

### A Positive Approach

The first step for many of us is perhaps the hardest of all. We must begin by realizing that the fate of business and the fate of the Government are irretrievably linked. Neither can now survive without the other. As President Kennedy has said: "We are committed to the defense of freedom around the world. When business does well in this country, and we have full employment, and this country is moving ahead, then it strengthens our image as a prosperous and vital country in this great fight in which we are engaged. When you do well, the United States does well, and our policies abroad do well. And when you do badly, all suffer."

Accepting this truth in turn implies, for many of us, ridding ourselves of the conviction that business and government are natural enemies. We cannot go on with the inane and immature game of cowboys and Indians which has been played too long in this country between business and government. We have to get over the idea that everything business does is right and that, by definition, everything that government does is wrong. We cannot, with the world as it is, turn back the clock, as some would have us do, to the nineteenth century. In fact, most of us would not do so even if we could.

This distrust of, or hostility to, government on the part of business is especially strong, of course, when there is a Democratic administration. The Kennedy administration has been

charged with being "antibusiness." Yet the fact is that the stock market has gone up 34 per cent since President Kennedy took office. And Attorney General Robert Kennedy has expressed the view that an American government which is antibusiness could not last very long. There were, in fact, fewer antitrust actions in the first year of this administration than in the last year of the Eisenhower administration, and fewer criminal actions involving business.

If we should concede that perhaps some of this antibusiness attitude exists mainly in our own minds and go along with the belief as recently stated by Henry Ford II that Americans cannot "afford the ludicrous spectacle of old-fashioned guerilla warfare between business and government," what then can we do in terms of specific actions and policies to help wage and win the peace?

For one thing we must realize the basic truth that the fortunes of the rest of the free world and the fortunes of this country are one and the same. What hurts our allies hurts us, and vice versa. Our partnership is forged into hardness by the great threat from the East which has been hanging over us all; by the natural flow of commerce among the nations of the West; and by the pressures of changing attitudes and economic practices. We can no longer stand alone economically nor regard the economic problems and progress of our allies apart from our own problems and progress.

There is perhaps no better example of this "economic togetherness" of the West than the recent development of the European Common Market. The members of the ECM have lowered tariffs among themselves by as much as 40 per cent. The result has been a rate of economic growth among member countries which has been twice that of this country. At the same time the Common Market countries have moved to erect a common tariff wall against outsiders. This would, of course, make it more difficult for our goods, and the goods of our allies, such as the Latin American countries and Japan, to compete in European markets.

There is no apparent answer to this problem other than cutting our tariffs so that the

members of the ECM will in turn cut theirs. President Kennedy has already begun to pursue this policy of lowering tariffs and asked in his State of the Union message for a new five-year trade expansion act to give him greater tariff-cutting authority. The need to follow a policy of lowering tariffs for the good of the nation, for the good of business, and for the good of the free world seems obvious. But there are those among us who are holed up in psychological shelters and bitterly and adamantly pre-disposed against tariff reductions.

The same situation exists in varying degrees in regard to other international economic policies of the Kennedy administration—the Food for Peace and the Alliance for Progress plans. Why don't we give such programs and proposals the benefit of a fair and open-minded appraisal, the benefit of a fair trial; before we declare ourselves against them primarily because they are Government inspired and Government sponsored? How long can business afford to cut off its nose to spite its face. How long can the nation, and indeed the rest of the free world, allow us to do it?

The head-in-shelter attitude has also been evident in regard to the exploiting of profitable business opportunities abroad. Many American firms, satisfied with their share of the domestic market, haven't even bothered to look into the potential of foreign markets. They choose, instead, to ignore these markets, while firms from other nations move in and walk off with the profits—and the jobs. This is poor testimony to the alertness, aggressiveness, and dynamism of American capitalism. How much of a contribution is it making to the successful waging of peace?

We cannot be economically effective abroad at all without a healthy, growing, and representative domestic economy to serve as a base of operations. If our foreign operations are the spearhead of a drive to win the peace, our domestic operations are certainly the supply and support elements of that drive. We can provide these necessary elements by following those principles of operation which most of us regard as sound business practices. Unfortunately, many of us give only lip service to such practices in our domestic operations, and in

our international trade we don't even give them that much attention.

We must trim, streamline, sharpen, and modernize our manufacturing, selling, distribution, and packaging operations. We must go into the battle lean, hardened, trained to a keen fighting edge. We must lead with the best products we can make and the best operational techniques we can develop. This means spending the money that needs to be spent on research and development, plant modernization, and the training and retraining of workers. We must get rid of "fat" and waste of all kinds. We cannot afford to be slovenly and soft.

We must get out and learn what the consumer wants in both the domestic and, especially, the foreign market. Once we know what he wants, we must make it, and most of all we must *sell* it—and sell it *hard* in the best tradition of American salesmanship. There is no better salesman in the world than the American business man once he gets going.

We must work out pricing policies consistent with maximum production. Low unit margins can mean high aggregate profits, as all of us know. Again, like good salesmanship, there is nothing more typically American than mass production and low prices. This approach to manufacturing and business operations has given us the lead in world industrial development and won for us the highest living standard in the world.

We also have to support more vigorously such programs as area redevelopment, unemployment insurance, and retraining to ease the effects of economic dislocations. We have to give more support to education and research at all levels and to local and state government programs for the development of community facilities. We need to give more of a boost to programs in the areas of housing, highways, and natural resources. This does not mean that the government will put us out of business. In fact, we will do even more business as new markets develop from these government-sponsored projects and policies.

This last point touches on what is a vital and sensitive area as far as many business men are concerned. This is the area which involves social reforms more than it does reforms in



business operations. It concerns ideas and theories more than it does techniques or profit-and-loss statements. Yet in today's world this area can affect the welfare of business and the nation as sharply as if it were a simple matter of dollars and cents. This is precisely the area that demands more flexible thinking on our part. This is not to imply that we should swallow whole hog the ideas and policies of this or any other administration. But we owe it to ourselves to give the ideas and suggestions an open-minded examination. It is possible that they just might be beneficial to business.

Take the problem of distressed areas, for example. We don't often think of the possibility that a distressed area might be the place for one of our operations. Yet this might certainly be the case; and in moving in we would not only be doing the area a good turn but ourselves to boot. At least these and other possibilities deserve consideration. Who knows? We might be missing something good just because we have allowed ourselves to be hobbled and neutralized by tradition and prejudice—by a shelter psychology.

Flexible thinking in regard to the human factor in business can help strengthen the image of capitalism and democracy abroad in waging the peace. When we help eliminate poverty, unfair employment practices, deceptive marketing techniques, and labor-management strife, we are not only *telling* the world that American capitalism and democracy work, but we are *showing* them that they work. Conversely, we must ask ourselves how much ground is lost as the result of price-fixing scandals, drug-price investigations, and featherbedding in labor and industry.

Disarmament is another subject on which poor thinking can cost us much. On the face of

it this is a negative concept. Nevertheless, assuming that the Russians make some concessions, disarmament could become a powerful positive force over the years. Certainly its hazards would not be much greater than saber rattling with thermonuclear bombs. In short, the movement could profit from the support of the business community.

The Peace Corps has not found particularly high favor with the business world, but some of our most valuable international technicians and representatives may come out of this somewhat-maligned operation. Encouragement of the project could increase the supply of such skilled personnel.

These are two examples of how—by taking a positive rather than a negative attitude, by coming up out of our “shelter” for a good look around—we can actually find something of great value in what we may have traditionally considered less valuable. We may find a practical payoff in what we may have considered idealistic “do-goodism.”

Through a more open-minded approach and more vigorous and enterprising day-to-day operations, we as business men can do our part in waging the peace in an area to which even the Russians are turning with more purpose and power. For there are many indications that they have already decided that nuclear war is not to their best interests either and that the real prize lies in waging and winning the peace for Communism—through trade and ideology.

It is a battle we must not let them win; it is a battle we must win. For in winning it we could achieve the greatest triumph in the history of the world—the saving of all mankind from the ravages and horrors of a thermonuclear holocaust. It is a prize well worth whatever struggle and sacrifice it takes to win it.



## Assuring the Continuity of Money and Credit

**James L. Robertson**

*Governor  
U.S. Federal Reserve System  
Washington, D. C.*

**N**UCLEAR WAR IS NOT INEVITABLE, BUT IT is possible. Nuclear weapons exist in abundance, they can be delivered swiftly to any part of the world, and there is no certain defense against them. Although these facts of the atomic age make the task formidable, we must do everything possible now to assure our survival as a nation in the event of an attack. By doing so, we may actually help to discourage an attack and to strengthen our nation's position to negotiate for world peace.

Victory, if one can speak of victory in connection with a holocaust, might go to the nation which recovered most swiftly from the effects of attack. Recovery would depend upon a high degree of organized economic activity: the specialized use of human and material resources—management and labor, skills and services, materials and equipment, plans and products. And in a modern nation, even under emergency conditions, such specialization is possible only when there is a trustworthy money and credit system: one on which the people, as well as managers of business and industry, can rely. Without this, all other elements of emergency planning, including wage, salary, rent, and price controls, have no meaning.

As for the role of money and credit in defense planning, we are reminded that Aristotle observed, over 2,000 years ago, that "the use of

money was devised as a matter of necessity." More recently, and even more appropriately, H. G. Wells said: "Without trustworthy money, a country is as paralyzed as a brain without wholesome blood. She cannot act. She cannot move. Employment becomes impossible and production dies away. Our civilization is, materially, a cash and credit system, dependent on man's confidence in the value of money." These are the reasons why a workable system of money and credit must be maintained even in an extreme emergency.

### Planning for Continued Operations

For more than ten years the Federal Reserve System has devoted an increasing amount of its time and attention to ways of assuring the continuity of our money and credit system. This activity was given official recognition when, in 1956, Arthur S. Fleming, then the Defense Mobilizer, assigned to the Federal Reserve Board extensive responsibilities in this field. Our approach was to identify the elements which would be essential to full recovery from an attack:

1. The Federal Reserve System and the commercial banking system must have

the physical capability to continue to operate. This involves preparations which are common to all businesses: physical protection, provision for continuity of management, establishment of alternate headquarters, and, most important, the duplication and safe storage of essential records.

2. The solvency of the economic system must be preserved despite widespread damage from a heavy attack. The economy must be insulated temporarily from the financial effects of the attack in order to carry on its essential services.
3. Adequate but not excessive liquidity must be provided to banks, businesses, and to individuals. Currency and deposit money must be available in sufficient amounts to assure continued production where it is physically possible.

Many of the plans necessary for the maintenance of these essential functions have already been made. The Secretary of the Treasury has issued an emergency regulation that requires all surviving banking institutions to continue operations, prohibits abnormal withdrawals and hoarding of currency, and restricts to essential purposes the use of balances in deposit accounts at the time of attack. The regulation authorizes the use of temporary banking quarters, the making of loans for essential purposes without regard to normal limitations, and the rationing of currency.

Authority has been delegated to the Federal Reserve Board to take the necessary action to maintain banking operations after an attack. The Board, in turn, has issued regulations that provide for the emergency operation of Federal Reserve banks and that authorize them to make reserve credit available to both member and non-member banks, so that no bank will be prevented by a lack of funds from carrying out essential operations. In addition, Reserve banks are authorized to make necessary credit available to businesses and individuals.

Both the Board and the Federal Reserve banks have provided for the continuity of their operations by establishing alternate headquar-

ters and duplicate record storage centers to which essential records are regularly sent. The Board's authority has been so delegated that in an emergency it could be exercised by the management of any Reserve bank. The Board has also distributed guidelines to the Federal Reserve banks for emergency monetary policy actions designed to help them in providing liquidity and confidence and in curbing inflationary pressures.

The availability of deposit money has been assured by providing for the decentralization of check-clearing operations. Check-clearing areas have been delineated, and in each of them a commercial bank or clearing house association has been appointed to act as agent of the Reserve bank in an emergency. These agents will clear checks within their respective areas and, in some instances, other areas, thus greatly reducing the volume of checks which otherwise would have to go to a Reserve bank or relocation site. Reserve banks have distributed emergency operating circulars that describe the procedures to all commercial banks.

Steps have also been taken to assure the availability of currency. Emergency supplies have been stored throughout the country on the basis of vault space available and relative security from direct attack. Plans are being developed to store additional supplies in very deep underground storage vaults. A cash-agent plan similar to the check-agent plan has been established. In an emergency, designated banks, acting as cash agents of a Reserve bank, would distribute currency among other banks.

Commercial banks have also been actively engaged in defense planning for a long time. In 1956 an Advisory Committee for Commercial Bank Preparedness and a Banking Committee on Emergency Operations were established. These committees produced and furnished to every bank in the country a series of seven booklets, five dealing with preattack preparedness measures and two with postattack operations. The work of these committees has recently been assumed by the Bank Management Committee of the American Bankers Association, which will continue to press for bank preparedness. The Federal supervisory agencies are kept informed of the status of the program

through their examiners, who discuss preparedness measures with lagging bank managements, with a view to speeding up the program and assuring a higher degree of readiness.

Our country has about 14,000 banks, with 10,000 branches, holding more than \$270 billion of deposits. Banks holding approximately 65 per cent of these deposits have initiated preparedness programs. Probably no other industry, composed of a comparable number of plants, has a preparedness program covering 65 per cent of its total capacity.

#### How the System Would Operate

Let us take as an example my home town, Broken Bow, Nebraska, where there are three banks. It is doubtful that any nation would intentionally aim a missile at Broken Bow; so let us assume a heavy attack on the United States in which Omaha has been hit and normal banking channels have been disrupted. With the information presently in the hands of all banks throughout the country, the banks in Broken Bow should know:

1. That they are to remain open and to continue banking operations.
2. That, in accordance with the Government's policy for the equitable sharing of war losses, any impairment of their assets for this reason will not be permitted to affect their operational solvency.
3. That Federal Reserve credit will be available to them, and since they are not member banks, emergency clearing accounts will be established for them at a surviving Federal Reserve office, which, in this case, may be the Kansas City Federal Reserve Bank's relocation office located 650 feet below the ground in central Kansas, if the regular offices of the Reserve Bank in Omaha, Kansas City, Denver, and Oklahoma City should not be in operation.
4. That they may safely accept, and will receive Federal Reserve credit for,

valid checks on banks in Omaha or elsewhere, even though the bank upon which the check is drawn may have been destroyed by the attack.

5. That there is an adequate supply of currency which may be drawn from cash-agent banks but that they must conserve it and prevent hoarding—by rationing, if necessary.
6. That they are to make cash and credit available for essential purposes.
7. That their banking operations and number of customers may be greatly expanded as a result of damage elsewhere.

#### The Future Task

We are proud of all the things that we have already done. However, several things remain to be done before we achieve a satisfactory degree of preparedness. The Federal Government needs to follow through on its announced policy for the equitable sharing of war losses by developing a stand-by operational plan to make that policy effective. Such a plan—needed to maintain the solvency of the economy in the face of war losses—is the keystone of emergency financial planning.

It is not enough that banking institutions have been informed of policies, plans, and regulations for the continuity of money and credit; they must become more familiar with these matters. Even though many banks have preparedness programs, these programs need to be completed, and the many banks that have not yet initiated preparedness measures should begin to do so. At best, the program for assuring the continuity of money and credit can be successful only to the extent that surviving banks, whatever their size and wherever they are located, are familiar with the program and are prepared to continue operations.

Managers of business and industry also have an obligation. Now that they have been advised of plans for the continuity of the banking system, they must avoid the impulse to withdraw and hoard currency in periods of grave international tension. To do so, in spite of the



measures outlined, would be a disservice to the nation and might subject them to war losses which could not be readily proved.

We should regard defense planning as a practical way of expressing our determination to survive and to protect our way of life. This

kind of planning is burdensome and distasteful, but our willingness to undertake it reflects our conviction that the more adequate our preparedness, the less probable is nuclear war; and if it comes, the less horrendous its consequences for survivors.

## Maintaining Vital Communications

**R. R. Hough**

*Vice President*

*American Telephone and Telegraph Company  
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**A** MULTIPLANT COMPANY MUST DECIDE FOR itself the extent to which it must operate during and following a disaster, and it must have a well-organized plan of action which can be put in motion immediately when a need arises. The plan adopted will vary among corporations according to such factors as the main corporate function and the actual location, relative location, and size of its plants.

There are many aspects to maintaining vital communications, but the applicability and weighting of each of them and the total integrated effect are still a matter of individual company judgment. However, the basic corporate plan will undoubtedly include:

1. Plans for the protection of life and property.
2. Designation of specific emergency assignments and the succession of authority.
3. Major disaster practices and procedures. These should, of course, be kept up to date.
4. Alarms, warning systems, and other features for alerting emergency forces or initiating close-down activities. Among the alarms and warning systems, consideration should be given to the "bell and lights" system which can be provided to furnish air defense warning signals relayed from Civil Defense control points.

### 5. Provision for adequate communications.

With specific regard to communications, there are a number of measures that can readily be put into effect. Telephone traffic control procedures should be established, as well as streamlined emergency operating procedures and overload control arrangements. Announcements can be recorded for emergency use in the telephone system, and a tape can be prepared for broadcast over the plant public address system requesting minimum use of telephones. An emergency-call list for key personnel by name and function should be constantly maintained. Provision should be made for non-listed, non-sequence PBX trunks for priority incoming calls, and priority service should be made available for important outgoing calls. Individual business lines can be provided at strategic locations, which bypass the PBX and connect either to the normal central serving office or to a remote central office. Labor-saving procedures such as the elimination of record keeping, person-to-person calling, and secretarial service should be established. Personnel requirements can be minimized through the use of mechanized services such as direct inward dialing. The company should set up an emergency communications center and be assured of the availability of sufficient personnel to operate the necessary communications equipment. Auxiliary personnel can be trained for emergencies.

There should be living facilities, including bedding and food, for operating personnel.

It is the corporation's responsibility to protect the communications equipment on its property from accident, malicious damage, sabotage, or the violence of nature. Equipment, terminal, and operating locations should be kept locked and secure from unauthorized persons. Emergency power should be available for all communications installations and for all battery-operated equipment such as the PBX and the paging and public address system.

Close coordination with the telephone company is indispensable. Space is needed in the plant for a telephone supply room and maintenance headquarters. The corporation should draw up and keep current, for telephone company maintenance and restoration procedures, a list of such essential services as central office lines, tie lines, and lines to other exchanges.

To assure continuity of service, existing tie lines can be provided with diverse routing, and additional lines can be established to other essential points. Within the plant, steps should be taken to set up communications within and between shelter areas through the PBX system. Supplementary equipment—such as transistorized, battery-powered radios and mobile radio equipment for company vehicles, boats, and aircraft—can provide additional contact outside the plant.

There are additional measures which are also worth thinking about, but these would take a little longer to accomplish. They must be

worked into the long-term communications plan. For one thing, all communications equipment should be located away from possible damage by fire, flood, or other hazards. This includes the PBX switchboard, dial switching equipment, and plant distribution cables. Consideration should be given to protecting the operators' room, switching equipment, frame, and terminals against damage by blast or radiation. All telephone cables and lines should be secure against damage by malicious mischief, sabotage, fire, flood, or building collapse. Underground service is best, but building conduit is considered the next most desirable. Some of these steps are relatively simple, but others will add to the cost of doing business and will call for policy decisions.

To assure service reliability the telephone industry has provided large cross sections of additional facilities on "express" routes which do not pass through major centers of population or industry but serve such centers by branch lines. It has also constructed many bypass or ring routes, which place transmission facilities outside of and around major cities and other designated target areas, and new major switching centers well away from potential target areas. A hardened transcontinental coaxial cable with a capacity of about 9,000 telephone circuits with underground repeater locations is under construction. Such facilities are used and are useful in the day-to-day job, and they also give considerable assurance of continuity of service in case of emergency.



## Restoring Production After Attack

**William H. Baumer**

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**H**OW SOON CAN WE GET BACK INTO PRODUCTION after a nuclear attack? We should all be asking ourselves this question and answering it, both by making careful plans and by taking constructive action as quickly as possible. We should also determine what part of our production is essential to life in the United States immediately after an attack. The textile business, for instance, isn't going to worry about bathing suits and Bermuda shorts, but it certainly is going to produce all the gauze that it can for bandages. The drug industry, of course, will worry a lot about penicillin production. Most companies make items which, while necessities today, wouldn't qualify as such under any hard appraisal in a postattack situation.

A 1959 report by the Office of Civil Defense Mobilization stated that after an attack we would have "islands of destruction." A total of some 263 hypothetical bombs, in this case study, hit 71 metropolitan areas, 132 military installations—mainly SAC bases—Washington, and 21 AEC installations. These 224 areas were blanketed with 1446 megatons of bombs, about seven megatons each, which is a fairly realistic figure. Although we hear that the Soviet Union has 50- and 100-megaton bombs, most of the bombs in their warehouses are the two-, three-, and five-megaton models; and this, of course, will be true for several years to come.

The Department of Commerce, in its business and defense services, has completed a list

of strategic companies in the seven key industries. Some of that material is classified, but we all know which are the 5, 10, or 20 major companies in any industry, and we know where their plants are concentrated. If a bomb hit in the New York area—the Department determined—in the electrical industry, for instance, there wouldn't be many suppliers left. This kind of exercise should be carried out and completely understood by every industry.

### The Crucial Factors

How soon a company can get back into production depends on four factors: men, materials, machines, and money.

**Men.** Manpower and technical know-how are number one in importance. Without manpower, all other things are useless or practically useless. People can do miracles in restoring a damaged plant if they are available, ready to work, and have the company's vital records to work from. We must know where our people live; our personnel must be made fully aware of our postattack plans; and we must help their families to understand the situation. We must certainly have shelters in our own plants, and these should be fallout-proof and somewhat blastproof. They should be built by somebody who understands thoroughly the whole archi-

tectural problem. Any company that produces a vital material or service should have an emergency control headquarters containing the necessary dosimeters, communications equipment, geiger counters, asbestos clothing, tools, and so forth.

**Materials.** The second factor we must consider is our source of raw materials and service materials. If most companies were to check on their sources of supply, they would find that their suppliers are located in a target area as bad or worse than their own. This is particularly shocking when the supplier is the only source for a particular item.

When my company recently investigated the fuel oil supply for ten of our plants, we found that it all came from one supplier and that his fuel tanks were more likely to be targets than our plants. So we would be completely shut down if anything were to happen to that company. When we discussed the problem with him and told him we were going to get another supplier, he said that he would put in a tank farm in a spot that was fairly safe. Each company should check its list of suppliers and give serious consideration to substitutes where necessary, because in a postattack production period we will have to find substitutes.

**Machines.** A large number of companies use common types of machines and should, of course, check into their sources of supply. They might even consider having some extras around. But the people who have machines that are one of a kind or rare should be particularly concerned. The users of a rare machine must be sure they have blueprints; that the blueprints are microfilmed; that they have extra copies; and that they buy ahead of time, if necessary, certain key parts and store them in a safe place. It is equally important to make provision for the survival of all the company's vital papers. The company must also know which of its machines have to be put back into commission to produce postattack necessities. Machines, after an attack, will not be used for frills; there will be no opportunity to worry much about such things as fancy packaging.

**Money.** Money is absolutely essential to pay our personnel, even though we may have to pay them in smaller amounts. We will also need

money for suppliers. We must all do our best to cooperate with the Government's plans to keep our monetary system healthy in the event of an attack. Anyone who witnessed the unbelievable inflation in postwar Germany knows the consequences of allowing the currency situation to get out of hand. This problem warrants consideration on the same level as continuity of management and supply.

#### **Facilities for Postattack Recovery**

A careful study of all the facts will make it clear that our industry can survive an attack and restore itself to a reasonably productive level. Although certain areas would be virtually obliterated, other areas would be left relatively intact. The problems would then be coordination, communication, and transportation.

My company has proposed to the Government the construction of a vital medical-supply plant underground in Texas. We offered to pay the costs of that part of the plant built on the surface, if the Government would pay the additional costs involved in building underground. There is a real need for this kind of facility, particularly in the field of vital medical supplies.

There has been some talk about creating another echelon of supply for our medical needs. One suggestion has been to put a huge supply warehouse underground in the Pocono Mountains and to rotate supplies through it. This project would involve all the major drug and medical firms and could provide an additional source of emergency supply. It would cost more money, but if supplies were rotated on a quarterly, semiannual, or annual basis, we would be virtually certain to have a stockpile of medical supplies in time of disaster.

However, there has been very little coordination so far within industry family groups. There is no reason why every industrial plant has to buy all its own emergency equipment. If each plant within a five-mile radius knew what the others had, one could buy the winches, for instance, and another the cranes; and they could pool their resources after an attack.

Coordination is also necessary with all

levels of government because we are certainly going to need such help in many areas. One of the major things that the Federal Government can do is to tell us frankly what the problem is, tell us what is needed, and put upon us a requirement that we can live up to. It is certain

that, when industry is acquainted with the problems of resumption of production, it will carefully appraise its own resources and will find out how soon it can get back into production and what part of its production must be continued after an attack.



## A Company Preparedness Program

### *I. The Over-all Organization*

**H. W. Fisher**

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Standard Oil Company (N. J.)  
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**T**HE BASIC PRINCIPLES OF CORPORATE SURVIVAL in a nuclear age have been established. Various tools and procedures have been suggested to accomplish this survival. It remains now for all members of industry to study their own special company problems and apply those principles to their individual situations. Implementation must be specific to be effective. This is doubly true if the program is to remain within reasonable cost. In short, it is a do-it-yourself program that is required by each company.

Standard Oil (N.J.) has applied in practice some of those basic methods which have been described of insuring survival and continuity as a corporate entity in the event that nuclear war should break out. We do not claim to have all the answers and believe that no one will ever have them on a permanent basis, since this is a dynamic situation.

The survival problem of Standard Oil (N.J.) in case of nuclear war is not unique. It is similar to that of a large group of companies which have affiliates scattered widely both in the United States and overseas and whose activities are coordinated through a parent holding company with headquarters in New York City. The large size and wide geographical distribu-

tion make getting hit in a nuclear attack a certainty. It is equally a certainty, however, that all of this complex cannot be easily wiped out, and therein lies our strength.

Jersey Standard has always been interested in security and the maintenance of continuity of policies. At the time of Korea it became obvious to us that the world was in for a long stretch of conflicts in various areas with unpredictable consequences which could, at worst, spread to a major war involving the use of whatever destructive weapons were available. It was evident that even the old 20-kiloton A-bomb, properly placed in New York City, could leave the parent corporation without any vital records or legal documents and eliminate key personnel at the same time.

The means taken to protect company records and provide for management continuity at headquarters are detailed elsewhere in this report by Kenneth E. Yandell. We also face broader aspects of security as it affects our Western Hemisphere affiliates: Imperial Oil Limited in Canada; Humble Oil & Refining Company, Esso International, Esso Tankers, Esso Research and Engineering Company in the United States; Creole Petroleum Corporation in Venezuela; and others. Paul E. Kuhl discusses

in a subsequent chapter the provisions that the Humble Oil & Refining Company is making. This company is in a transition state at the moment because of the moving of the New York headquarters of the former Esso Standard Oil Company to Houston and the consolidation there of the whole domestic operation.

### Over-all Organization

General policy, of course, originates with the board of directors of the parent company. In implementing it, one director is appointed contact director for security (with an alternate) and has the responsibility for seeing that general guidance in this phase of operations is given to the affiliates. From the contact director security policies are communicated through two committees, (1) the Jersey Security Committee for the New York area and (2) the Intercompany Security Committee for the Western Hemisphere affiliates. These committees have the same chairman and secretary to insure continuity. Meetings are held as necessary, but a great deal of interim business is done through the office of the secretary of the Jersey Security Committee. Information on government activities, pertinent security matters, and the like are forwarded to the affiliates as it becomes available; questions are answered; and in many cases individual action is secured from the security committee members without formal meetings.

### Factors Affecting Security

Security is not a static situation but changes constantly. The security organization has to recognize this fact and cope with it. There are many factors which make the security business a dynamic problem.

Changes in the technology of warfare vitally affect programs. Bomb sizes have doubled each year in the past decade. In 1952 when the threat was from 20-kiloton A-bombs, our Morristown Remote Control Center was well back in the hinterlands and a reasonably

safe place with respect to blast damage. In 1960 we reviewed the situation as it was changed by the development of the H-bomb, which has yields in excess of 20 megatons. We learned that retaining the Morristown site had become a calculated risk, but when greater safety was weighed against accessibility, it was agreed that the center should be continued. The huge size of today's nuclear bombs has greatly reduced our protective capabilities and has also changed a lot of our thinking: we now talk about fallout shelters, not blast shelters.

We are currently weighing the advisability of broadening the geographical base from which we recruit the teams which will operate the Morristown Center. Since the entire New York metropolitan area is within a probable target area, our present locally dispersed reporting centers could be a rather futile gesture. Because of changes in our organization and technological advances, we are wondering if it is time to reassess our over-all security program. Such a reappraisal might change the concept of our approach to this problem. Unless and until we do, however, we are sticking with what we have.

The consolidation of Esso Standard into Humble Oil & Refining Company and the removal of key personnel from New York to Houston require changes in plans for operating Morristown. Most of the domestic supply people, for example, are now in Houston. Similarly, Esso Eastern is now a Jersey affiliate to be incorporated into our plans, whereas Stanvac, from which it comes, operates independently.

From these actual problems we can see that over-all corporate provisions for continuity of existence need to be both flexible and sensitive to the need for change. The operation need not be expensive, however, and formality should be minimized. Only one man is devoting full time to this phase of security in New York for the parent company: the secretary of the Jersey Security Committee, who has a clerical staff of two. The joint chairman of the two security committees is currently being borrowed part time from Esso Research and Engineering Company and gets together with the contact director for security as often as required—usually every month but sometimes more frequently.

## II. *Protecting Headquarters Operations*

**Kenneth E. Yandell**  
*Security Coordinator*  
*Standard Oil Company (N. J.)*  
*New York, New York*

**N**O PRUDENT BUSINESS MAN WOULD OPERATE without knowing whether his business should insure itself or should buy protection from an insurance company. However, available statistics on preparations for defense indicate that a woefully small number of business men have gone as far as seems desirable to provide even a minimum of protection against nuclear attack.

To establish an effective security program, top management backing is most essential. In our particular situation, we have found that in addition to the guidance of the contact member from the board of directors, the Jersey Security Committee and the broader Intercompany Security Committee have functioned quite satisfactorily in steering our security program. Conferences are held periodically, and participants are then able to keep their respective managements abreast of the over-all company security program. The implementation and specific action, of course, are left to the several affiliates, since decentralized management is the policy of Standard Oil (N.J.).

Among the Jersey Security Committee's earliest recommendations was a five-point program which became the nucleus of the Jersey Security Program. It suggested the following:

1. Storage of all vital corporate records in a safe place.
2. Designation of alternate company headquarters for emergency use.
3. Preparation of management-succession plans.

4. Amendment of corporate bylaws, where necessary, to facilitate emergency action.

5. Protection of all vital production, research, and operations facilities against sabotage and espionage.

At the inception of the Korean conflict, it was recognized that the world situation might result in a sizable disaster which could cause our New York headquarters offices to become inoperative. Without some semblance of coordination among our affiliates, petroleum supplies for the military and essential civilian needs would suffer immeasurably. An Alternate Corporate Headquarters and Remote Control Center was established in Morristown, New Jersey. The physical facilities there were ideal for the needs of an operation of this sort. The building chosen was formerly a rest home. Its 50 bedrooms, some double size, are equipped to serve as both working and sleeping quarters. In addition, there are eight offices which could be used by commuting executives.

We also earmarked alternative executive operating teams, which would report there as needed. The theory was that when the international situation became really ominous, one of these teams would always be in residence at the Morristown Center. The teams would rotate every few days so as to cause the least possible disruption to the New York daily operations. Moreover, corporate bylaws were changed to see that the authority of the directors was passed down to other executives in Jersey Standard and



in the top management of the domestic affiliates. It would be possible to reconstitute the whole company even if no directors survived a major disaster.

### **Protection of Records**

One of the few improvements necessary was the construction of an underground vault of reinforced concrete, which is used primarily for microfilm storage. At the present time there are some 31 million images—in 16-, 35-, and 70-millimeter sizes—stored in the vault, and there is adequate space for at least another ten years' growth. No effort has been made to withdraw obsolete microfilm, since it would foul up the original indexing. Eleven microfilm readers of various types are provided to view the filmed records as necessary. Facilities are also available for reproducing paper facsimiles in any quantity desired from the microfilms. To increase the records-insurance factor, duplicates of all microfilms are made and sent for storage to one of our Midwest affiliates. Copies of operating records and other items of current information are stored in 54 metal file cabinets. Both records and microfilms are dispatched daily to the Center.

### **Provision for Communications**

The communications setup at our Remote Control Center is composed of telephones and radio. Our three-position switchboard, in addition to handling the house phones, is the central office for tie lines and trunk lines going to a number of our field and affiliate facilities, as well as to employee reporting centers. After considerable effort, we acquired the telephone numbers of the Government relocation centers which we would normally be expected to contact in event of an attack. We are assured that the telephone numbers of our central emergency headquarters and our affiliate emergency centers are recorded at the proper Government relocation centers.

Mobile radio communication from our emergency headquarters is maintained with one of our refineries, which is approximately 25 miles away. Although this communications medium is limited, it still would serve a good purpose if the refinery telephone were operative but the alternative headquarters were not. Another source of communications is a Gonset radio set tied in with the county Civil Defense headquarters. We are assuming that if all other communications fail and a sufficiently high priority message is to be dispatched, county Civil Defense would cooperate. The installation and utilization of over-all radio facilities as a backup to our telephones has been considered on several occasions. In each instance, we decided against this because in event of an attack only a very limited number of closely controlled radio sending and receiving stations would be permitted to operate.

### **Emergency Procedures**

We recognized that an unexpected bombing attack on the New York metropolitan area during a work day would make it necessary to import executive personnel with a knowledge of headquarters operations from our field affiliates to man the Remote Control Center. Emergency operating manuals are stored there, and they cover the essential departmental operations which would be helpful, as a start, in reconstituting the company's business.

Should an attack be launched while we had a rotating team at our emergency center, it would be necessary to provide living accommodations for a sizable group. In addition to our underground vault, the basement area has been converted to a shelter for the hundred or more persons who are concerned. Some basement windows have been removed and bricked up, and earth has been banked on the outside to a point where the attenuation factor is quite acceptable. A variable-speed blower fan with adequate filters will furnish the necessary air changes. Two exhaust blowers assure equal air distribution and eliminate air stratification.

The dining room in the main building can

comfortably seat 100 persons. A food inventory is maintained which will accommodate the same number of persons for a two-week period. An uncontaminated water supply is available from an artesian well with a capacity of 40 gallons per minute. A 50-kilowatt electric generator was installed which will be capable of powering critical units in event of an outside power failure. While it falls far short of normal needs, it will still be adequate to handle the minimum requirements. Finally, a chain-link fence has been erected to enclose some six acres, including the central buildings. Since the center has been in operation, the area has been patrolled by contract guards around the clock seven days a week.

Although the majority of our domestic affiliates and all of the larger refineries have compiled operating manuals to cover their security procedures, we in the New York headquarters have not. We felt that dry runs would serve a much better purpose than a manual, which too often lies in the bottom of a drawer gathering dust. A test exercise has been scheduled for each year, except 1961. The exercises have, with few exceptions, coincided with Civil Defense "Operations Alert" and are tied in with them. The three executive teams and staff personnel are rotated, which insures that each team participates every third year. In addition to gaining firsthand information on what would be expected in event of an emergency, a number of flaws were discovered.

To determine better if the proper records were being maintained at the Center and if the facilities were properly established, exercise problems simulating emergency conditions have been given to the participants. A large map is displayed showing the location and size of bomb drops. The recognition and evaluation of bomb damage has always been an integral part of these tests. We expect the various problems to be solved by using records and data stored at the emergency center. Critiques are held afterward, and the participants must explain the procedures and methods they used to arrive at their conclusions. It is not unusual to have Government representatives from those Federal agencies with which we would likely be associated, in an emergency, as observers and judges. Some-

times they prepare the problems, and they make many of them pretty tough.

In 1956, to test our program further, an unannounced dry run was scheduled. The "principal" team started receiving telephone calls at 5:30 A.M. It was told that a simulated emergency was in effect and that it was expected to report to the Control Center as soon as possible. The first participant arrived at 6:30 A.M. and the last at 10:30 A.M. The latter was one of our Jersey Board members, who had driven some 65 miles, mostly through heavy traffic. The attendance response was 99 per cent effective in the executive group and 92 per cent effective in the staff group. It is most essential to test any program. It is one thing to draw up a program, but without proper testing there is no assurance that it is going to meet the needs adequately or fulfill the purpose intended.

### Auxiliary Reporting Centers

With the top executive group assigned to the emergency center for policy and decision purposes, who is going to do the work? Since no more than 1 per cent of the several thousand New York City employees could operate at the control center, 16 Reporting Centers were established at or near employee population centers scattered throughout the metropolitan area in New York and New Jersey—nine on company property and seven in employees' homes. All headquarters employees carry company identification cards which list the addresses and telephone numbers of the Reporting Centers. They are advised to report to the nearest center after a catastrophe as soon as it is safe to travel. A telephone tie line is set up between each Reporting Center and the Emergency Headquarters. On file at each center are personnel security cards for each of the 3,800 employees working in the headquarters offices, along with a number of predrawn checks. The checks are in the amounts of \$25 and \$100 and require one properly authorized countersignature. Each of the Reporting Centers is staffed with 15 employees, 11 to handle personnel matters and four to take care of the check countersignatures.

As employees report to the centers, they will receive instructions from the emergency center as to what is expected of them. It is hoped that at these rallying points various teams will be set up for such responsibilities as supply, marine, and manufacturing. With transportation facilities at a minimum and deficient communications, it is anticipated that it will be a real chore getting the wheels to turn again. Anyway, should an emergency arise, much of the groundwork will have been laid, and it will be much easier than starting from scratch.

To some companies, our program might appear to be prohibitive in cost. However, we consider it to be worthwhile insurance. The initial investment was substantial, but the physical equipment is being amortized through normal depreciation, and the operating aspect is debited

against operating budgets. In fact, our Remote Control Center provides some actual credits as well. For the past six years it has proved to be a very popular company meeting place. In 1960 more than 3,000 man-days of meetings were scheduled. An outside caterer is under contract to provide the necessary help on call, and domestic services are also handled by an outside contractor.

In addition to the main Remote Control Center, emergency headquarters have been established by our five domestic affiliate companies at points remote from their central offices. These include producing, manufacturing, pipeline, and research operations and serve as rallying points from which to transact business and as depositories for the preservation of essential records.



### III. *Protection for Subordinate Units*

**Paul E. Kuhl**

*Administrator-Coordinator  
Manufacturing Division  
Humble Oil & Refining Company  
Houston, Texas*

**T**HE DISASTER SURVIVAL PLAN FOR HUMBLE Oil & Refining Company is more in the form of a rough draft than of a final course of action. Although we moved slowly at first—and with good reason—our pace now is quickening, and we are progressing faster.

It has been only two years since the new Humble was created by merging the former Humble Company with Esso Standard, Carter, Oklahoma, and Pate oil companies. And it has been only one year since this amalgamation of Standard Oil Company (N.J.) affiliates was re-organized along geographical lines in some cases and along functional lines in others. Humble chose this varied organizational pattern because of the widespread and diversified nature of its operations. Some Jersey affiliates that were merged into the new company had done substantial work on disaster survival plans, while others had done very little.

There also is a second reason why we started slowly. It is our conviction that any nuclear fallout protection plan must be—of necessity—a joint industry and community project. The communities have generally been slow to move ahead on this problem, and this has hindered our planning. But in some communities where Humble operations are located, there are encouraging signs of a public awakening to the problem. Thus, to date, Humble has progressed rather well toward protecting its corporate operations in the event of a nuclear

disaster, but its program for employee survival still needs a considerable amount of study.

Because of the widespread nature of our organization, we have some advantages as well as some special problems. Humble as a subsidiary of Standard Oil Company (N.J.) is responsible for its domestic petroleum exploration, production, refining, transportation, and marketing. It carries on exploration or production in 20 states, markets in 45 states, and operates ten manufacturing plants. Humble's production and marketing operations are conducted in more than 925 widely dispersed operating centers, and—except for four regional offices—most of these centers involve rather small numbers of personnel.

This wide dispersion is in itself a favorable factor in our planning for survival. Thus, we have reason to be more concerned with plans for survival at our headquarters office in Houston; our three regional offices in New York, New Orleans, and Tulsa; and our principal refinery sites. The Houston office includes—in addition to headquarters—one regional office and one research center, as well as the Manufacturing Division office and the company's marine and pipeline offices.

We employ a total of 40,500 people, but our greatest concentration of personnel is in Houston, where more than 4,000 employees do office or laboratory work. The Manufacturing Division has about 13,000 persons, of whom

11,250 are in three relatively large plants. The remaining seven plants are small and have anywhere from 50 to 740 employees.

Our preparedness problems, we think, are very much like those of any large organization or industry which the Government considers essential to national security. As with other essential industries, our goal is not only our own survival but also getting back into operation to serve the community. We have a possible additional problem in that at each of our refineries and large distribution terminals very large quantities of combustible materials are stored, and these present serious fire hazards.

Our preparedness plans are not as complete as we would like. This is partly because we have not been sure what was needed or how our plans would mesh with those of the Government and the communities in which we operate. But it also is partly because we have been involved in substantial reorganization and transfer of offices over the past two years. On both scores we are now in a much better situation. The moves associated with our merger of domestic Jersey Standard affiliates are now about complete.

Our program is based on the assumption that a massive nuclear attack could wipe out completely the personnel and equipment at any one of our locations but that the majority of our installations would not be destroyed. We have also assumed that protection against major bomb blast and thermal effects is impractical but that a great proportion of our employees and their families would survive if protected against fallout radiation.

To insure continuity of management, an Emergency Management Committee (that would operate in the event that the board of directors was unable to function) and an alternate committee have been named. The members of the alternate group are all from operations far from Houston and widely separated geographically. It is also planned that if Houston were destroyed, Humble's regional management at Tulsa or New Orleans would assume supervision of the exploration, production, and marketing operations of the company; and refinery management at Baton Rouge or Baytown would supervise manufacturing opera-

tions. As promptly as possible the surviving members of the board and alternates would assemble at Tulsa or New Orleans. Necessary records will be kept current at each of these locations. One member of Humble's board of directors has been assigned responsibility for our security matters, and he has been made chairman of an eight-man committee. The members are primarily at board level, and each man represents a separate function of the company. (The survival plans of the several companies merged into Humble are temporarily being continued until the new program is firmly established.)

Our greatest attention has been given to security at our refineries and large marketing terminals. Most of these operations are located along the Eastern Seaboard and Gulf Coast, adjacent to large centers of population. Very large quantities of combustible materials are stored at these sites. Thus, there might be a serious fire hazard. If a large bomb were dropped close enough, the blast damage, or intense radiation heat, might set many storage tanks afire. These points have been given the greatest attention, not only because of the concentration of personnel and the investment involved but also because it would be important for both civilian and military considerations to restore operations at these sites as quickly as possible. Our communities must keep their people warm and supplied with electricity for refrigeration and for hospitals, and we must restore our supply of fuel to them.

Refinery construction is normally such that the process equipment will withstand quite severe blast forces, but there is the possibility that a great number of fires would start, and these might result in a fire storm. For this reason we have concluded that we should provide shelters at these plant locations for only those persons required to effect an orderly shutdown of operations at the time of a warning. All others would be encouraged to evacuate the area and proceed to available fallout shelters.

Even where we have large numbers of employees in offices separated from combustible materials, we feel it is impractical to provide shelters for these people at the work site and to expect that they would stay there—out of contact with their families—for the time required to

allow fallout decay. Furthermore, we are *not* convinced that our employees, along with the public as a whole, will very soon build individual family shelters; consequently, the only practical program seems to be one of providing community shelters. Therefore, we stand ready to cooperate with the communities where we do business to help provide such fallout shelters and to develop programs for their operation.

Each of our refineries and large marketing terminals has worked with local Civil Defense authorities and has encouraged the development of community plans. In most cases we also have joined with other industries in the area in the development of mutual assistance plans. Each of our refineries has designated two alternate sites where the management personnel of the plant would assemble in the event that a refinery

were destroyed. Essential records—including lists of personnel—are kept at each of these sites, and plans (as yet not complete) have been made for maintaining communications with other refineries and with Tulsa, New Orleans, and Morristown.

We feel we have progressed rather well toward what we believe is a practical disaster survival plan. We find that it was only in the fall of 1960 that Humble made its first overtures toward formation of a definite plan. At that time one of our directors was asked to review the company's security measures. Our bylaws were examined and found to be satisfactory as written—inasmuch as Jersey Standard is the sole stockholder of Humble, and the parent company could readily make any necessary changes in a matter of hours.



## Emergency Planning by Non-Manufacturing Companies

**Gerhard D. Bleicken**

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John Hancock Mutual Life Insurance Company  
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**T**O SURVIVE A LARGE-SCALE NUCLEAR DISASTER and to insure continuation of its business, a corporation must have ready a three-way defense against the effects of disaster. It must provide for (1) the continuity of management; (2) the protection of personnel; and (3) the preservation of vital corporate records. This type of corporate "insurance," although sometimes slightly modified, is being taken out on a large scale by non-manufacturing companies, principally the banks and insurance companies. My company is no exception.

*Management continuity.* At our last annual meeting our policyholders amended the company's bylaws in such a way as to provide the board of directors with emergency power to fill board vacancies when less than a quorum was able to act. The board then established the procedures necessary to accomplish this spelling out of specific conditions and provisions for the continuation of management. Obviously, this process must follow the highest order of legality. In this connection The American Society of Corporate Secretaries is studying currently the approaches being taken by various corporations, including John Hancock, in an effort to develop a suggested guide for other companies.

*Protection of personnel.* We are particularly proud of the survival program for our home-office personnel. The development of an

industrial shelter was not easy. Early in 1960, when we re-evaluated our existing disaster plans to meet changing conditions, we received valuable assistance from Federal, state, and local Civil Defense officials. We had to relate the advice we received to our own plan and equipment, and even then we had to fill in between the lines. We called upon experts from Arthur D. Little, Inc., Technical Operations, Inc., and M.I.T. to identify and measure the protection of core shelters. To install the area monitoring system, our electronics specialists became radiation-detection experts.

Supervising this development of a prototype industrial shelter was a small committee of young men, who deserve recognition. We looked for members of management who had been in the armed forces and who had lived under stress conditions. Those we selected had varied college backgrounds—medicine, law, and mathematics—and their jobs in the company included policy issuing, medical care, personnel administration, and underwriting research. The development of a shelter program was added to their regular duties, and supervision came from senior management. It seems fundamental to us that effective control in case of a disaster should be exercised by established line management, from the chief executive officer down through the organization. Therefore, each man-

ager is totally responsible for the safety of his people during a disaster. A similar defense planning committee should, in our opinion, prove effective in all types of companies.

The John Hancock building, by nature of its construction, has protective features which are among the best in the Boston area. After a thorough evaluation of the plant and equipment, we outfitted the building with new devices to provide safety and livability for 6,000 occupants for more than ten days. Our core shelters are designed to offer protection against blast and fallout. They have all the facilities and materiel essential to basic survival: food and water, medical supplies, power generators, ventilation and air filtration, radiation detectors, and communications equipment.

*Preservation of records.* After the personnel have been protected and the equipment made as secure as possible from damage, it is necessary for any corporation to identify its truly vital records and to provide for their preservation. A study of company record keeping can be valuable in any case by bringing about the elimination of unnecessary records and documents. An insurance company, however, has the toughest record-keeping job of any corporation, and this complicates the whole process of survival planning immensely.

The procedures we follow in this matter of the preservation of records are to:

1. Identify those records which provide basic information for absolutely necessary functions.
2. Determine the duplication of data in basic records.
3. Evaluate various means of preserving specific records.
4. Consider cost limitations.
5. Pay attention to space limitations.
6. Review periodically the current status of the preceding estimates.

A Personnel and Property Defense Committee was appointed in 1950 to study the overall problems of corporate survival. A subcommittee was responsible for developing and later reviewing the company's records-retention program. The subcommittee first obtained from each department a listing of those records which the particular department considered "vital" in

its work and made a list of the minimum amount of records needed to reconstruct corporate identity, policyholder status, and investment status. These records were given "A Priority." We rejected for storage those records which would be only convenient to have or which would duplicate records in another form. We coordinated records which could serve several departments and decided on the method—listing, punched card, or microfilm—which was best suited for storage and subsequent reproduction. The subcommittee was allowed reasonable cost and space limitation.

Senior management accepted the 1950 recommendations and approved a definite records-retention program, which provided for orderly retention, duplication, and preservation. But the program was subject to change. In March 1958 a companywide appraisal was made of the material of "A Priority" to eliminate any records that were no longer necessary, to add necessary additional records, and to change the form of the record where appropriate. In October 1960 the subcommittee again surveyed the company's program in conjunction with a study of our entire records-retention program. As a result, in many instances the departments reduced retention periods or eliminated certain records. The savings in terms of filing cabinets or reclamation of floor space were considerable. Incidentally, the proceeds from the sale of wastepaper covered some part of the annual cost of storage.

Once they have been identified, a place must be found where the records will be safe from blast and fire damage and where there will be adequate light and power for the facility during an emergency. A burglar-alarm system, a communications system, and temperature-humidity controls will be needed. Safe accommodations for the guards should be provided. Finally, there should be microfilm readers, reproduction equipment, an index, and a destruction schedule.

We know that many companies with a records-preservation plan make use of a personal depository, either owned or rented, although an increasing number of companies are turning to cooperative "atomic storage centers" for the storage of their microfilm and tapes.

Our current records depository is located approximately 30 miles from Boston. It was selected some years before the development of present weapons and delivery systems and before the company automated some of its processing. Because of the nature of the construction of the building, its proximity to Boston, and the change in the types of records, we are re-assessing both the site and records to be preserved.

A safe building, vault, modified cave, cavern, or what have you, fully equipped to sustain life and preserve records, costs money. In fact, it would cost more money than any individual corporation would want to spend or should be asked to supply. Moreover, to be properly utilized, the site should have mechanical equipment to read the data on punched cards and tapes and personnel to run the machines and to reconstruct the status of the corporation from data. The logical, economical answer is to build and utilize a cooperative depository with other companies whose business is similar. Toward this end, we have begun to explore with other life insurance companies the desirability of a common records center. We anticipate many problems, particularly in the areas of me-

chanical and electronic equipment and personnel pools, but we believe there is no better alternative.

From a realistic standpoint, an insurance company having its major office in a target area will not have a "business as usual" sign out the following day. We can reconstruct our status with the stored vital records. We can draw heavily on the records of branch offices, banks, commercial institutions, and so forth. But the Government must tell us its intentions in reference to the postattack pooling of claims, losses, and assets among the nation's financial institutions which are under Government control.

This whole matter is, of course, complicated by the fact that in time of peace the life insurance business is regulated by the states; but in time of total war, control of the nation's assets and of payment of debt is exercised by the Federal Government. Without sound, intelligent leadership from the Federal Government and the state insurance commissioners, the problem of maintaining, in a safe place, duplicate records reflecting the status of the company as it was at the time of attack is practically insurmountable.



## The Economic Impact of a Nuclear Attack

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**L**ONG-RANGE RECOVERY AFTER A NUCLEAR attack will depend in considerable measure on the balance or imbalance that exists among the human and material resources which survive the attack and its immediate aftermath. Ours is a complex society of many differentiated and interdependent parts. If the balance among these parts is too severely disturbed, the economy may not be able to function or may revert to the technology of an earlier era. To a degree this question of balance can be examined independently of the *scale* of the attack and the corresponding scale of the surviving society. Of course, more drastic dislocations are possible with a large attack than a small one; but the question most important to the economic recovery of the surviving society is not the size of the attack but which of the various components of the economy are damaged. Although this depends in part on the objectives and design of the attack and on the scale of the attack, it depends even more so on the existing geographic distribution of our human and material resources.

### **Distribution of Resources**

We know, or can find out, a great deal about the existing geographic distribution of

our resources. We also know fairly well the probable effect of nuclear weapons on these resources at various distances. Thus we have the tools to examine the probable effects of any number of alternative attack patterns. However, we do not need to examine an infinite number. We can determine, over the range of possible magnitudes of attack, just what kinds of patterns would be most damaging to us in different ways. The attacker may not choose such a pattern, for any number of reasons (or may not be able to effect it even if he chooses it). If he does not, however, our problems of recovery will be correspondingly reduced. Thus we can confidently set some limits to our problem.

To illustrate this approach, we have grouped the population and industry of the United States somewhat arbitrarily into a series of non-overlapping square target areas, 20 kilometers on each side. Each of these covers about 150 square miles, with an "average radius" of about seven miles. This is about the area within which most industrial buildings would be seriously damaged by a 10-megaton weapon. (A 50-megaton weapon would inflict equivalent damage over more than twice this area, but there are few target areas in which the damage would be much greater as a result, for 150 square miles will more than cover the built-up portion of most metropolitan areas.)

### Contents of Potential U.S. Target Areas

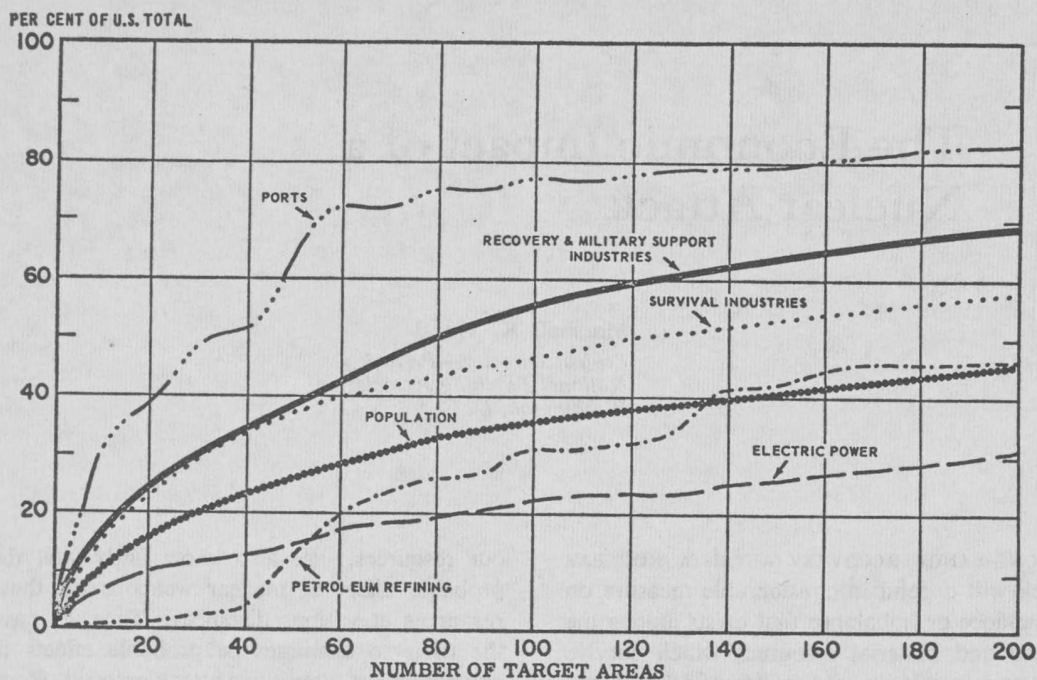


EXHIBIT 1

If we were to chart the cumulative percentages of six major classes of resources which are concentrated in the 200 largest target areas, arranged from the largest to the smallest in order of population, the resulting curve would rise rapidly at first. Twenty-five per cent of the population would be in the first 40 target areas, but only about 45 per cent would be covered in all 200 target areas. (See Exhibit 1.)

Even when the ordering of targets is based on population, the percentage of industrial production rises much more rapidly, reaching nearly 35 per cent for 40 target areas. The percentage of industries most important to recovery and support of military production continues to rise fairly rapidly, with over two thirds in the 200 target areas. Industries primarily important to human survival taper off more rapidly, the percentage rising to about 58 per cent at 200 target areas. Port capacity—measured in number of berths—rises dramatically to over 70 per cent at 60 areas and 80 per cent at 160 areas. As regards two of our most important basic industries, we find petroleum

refining rising much more slowly than population up to about 135 areas and then rising slightly above it. Electric power generating capacity remains at about two thirds of the population over the entire range.

The figures on industrial production (included in these 150-square-mile target areas) probably measure the extent of damage to industrial capacity fairly well. However, it is not obvious that the figures for population are representative of the probable fatalities. There are substantial numbers of people around many target areas who live beyond the 150-square-mile central core but who would still be subject to direct blast and burn injury. Also, of course, people may become casualties from fallout at distances of up to several hundred miles.

#### Reliable Estimates of Casualties

Preparation of reasonably reliable estimates of casualties requires much more refined

techniques, including careful war-gaming of specific attacks with the type of weapons and method of employment carefully tailored to each target area. Such an attack pattern is likely to include a mixture of air-burst weapons, which produce no fallout; and ground-burst weapons, which do. It will also include many weapons, probably a majority, directed at purely military targets. It may include more than 200 targets, but there seems little chance in the foreseeable future that as many as 200 *non-military* targets could be attacked successfully. The number of military targets which the attacker must destroy to insure his own survival seems likely to rise over time—under current and projected American military programs—at least as rapidly, and probably more rapidly, than the offensive-weapon delivery capability of the Soviet Union.

A comparison (see Exhibit 2) between population fatalities and manufacturing-capacity loss for a large number of such carefully war-gamed attacks—all related to the probable offensive capability of the Soviet

Union and the defensive capability of the United States in the first half of the current decade—would show that the fatalities are indeed higher than one might have been led to expect from the population figures of the particular target areas. Thus, at a scale of attack which resulted in a 30-per-cent loss of industrial capacity, the fatalities would also be about 30 per cent, whereas target areas with 30 per cent of industrial capacity include only 20 per cent of the population. When the manufacturing-capacity loss goes to 60 per cent, the fatalities would be 48 per cent, whereas the target areas which included 60 per cent of the industry important for recovery and military support include only about 38 per cent of the population. We may expect fatalities would be about one-third higher than the population figures would indicate.

#### The Importance of Reserve Capacity

The question is whether the relatively greater damage to industrial facilities, as

*Contents of Potential U.S. Target Areas*

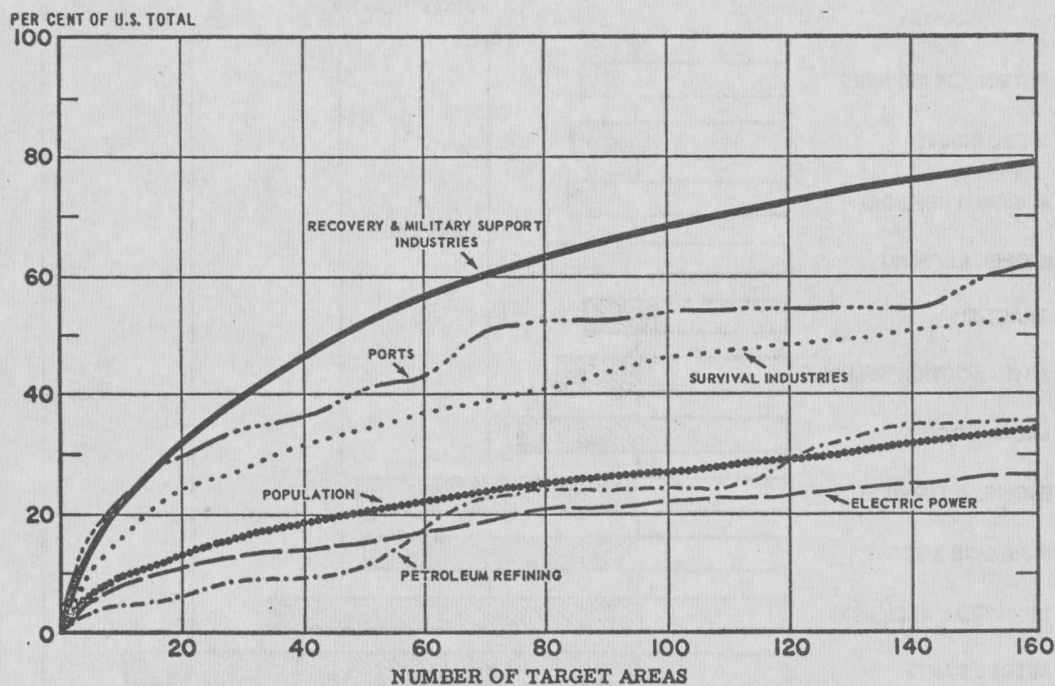


EXHIBIT 2



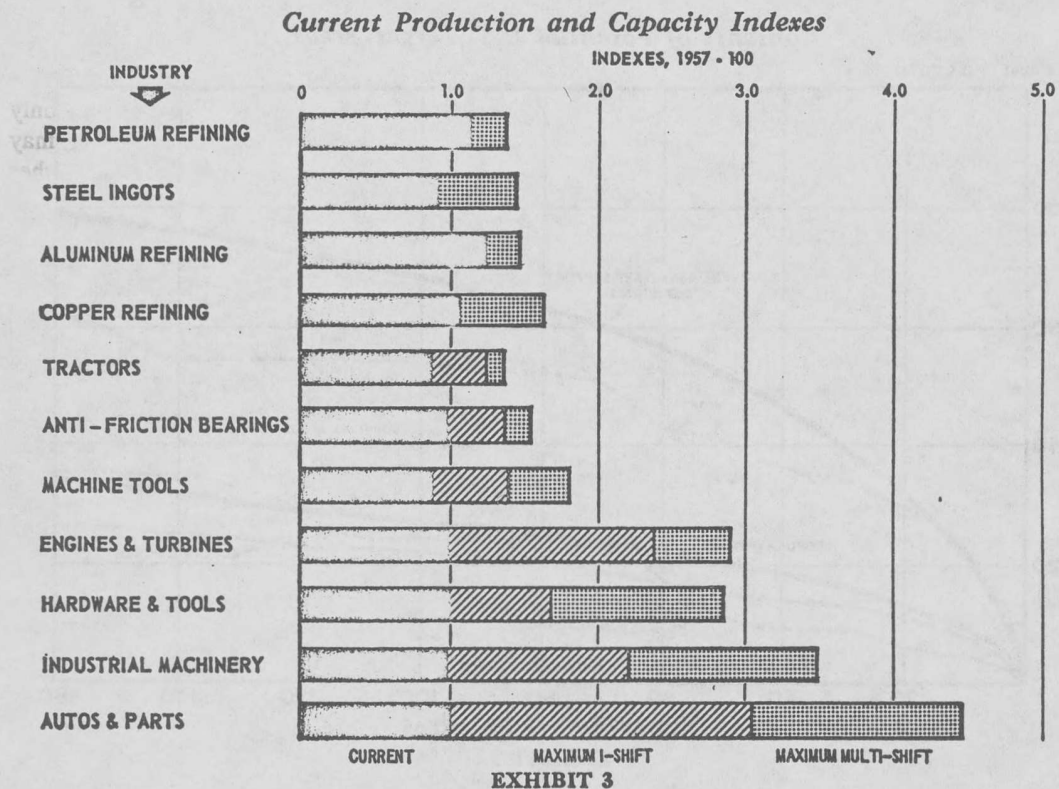
compared to population fatalities, would jeopardize economic recovery. Some have argued that it would and that a shelter program, by reducing population fatalities and thus increasing the ratio of surviving population to surviving industrial capacity, would make recovery even more difficult. Others do not agree, because this theory overlooks the tremendous reserve capacity which is normally present in most industries. It also overlooks the sharp reductions in personal consumption rates which would be possible in a national emergency without jeopardizing either our economic efficiency or our political and social system.

Most manufacturing industries normally operate considerably below their single-shift capacity and at only a fraction of their multiple-shift capacity. Estimates of the relationship between current production, peak single-shift capacity, and peak multiple-shift capacity for a representative selection of manufacturing industries show that peak multiple-shift capacity is

more than double actual production in most industries and that in many industries it is three or four times current production. (Exhibit 3.) Thus, it is clear that even if the ratio of fatalities to capacity loss were greatly reduced by a shelter program, there would still be adequate capacity in most industries to support survival and recovery. Therefore, the principal limitations on production would be (1) the over-all availability of manpower and (2) the loss of productivity resulting from differential fatalities among different manpower skills.

It remains possible that some individual critical industries, more narrowly defined, might be much more highly concentrated than the broad industry aggregates we have so far considered and might thus constitute serious bottlenecks to recovery. Petroleum refining and port capacity would both seem to be possible bottlenecks, if they were specifically selected as targets.

Eighty-six per cent of the petroleum re-



fining capacity or 98 per cent of the port capacity could be included in 50 target areas, if either were selected as a primarily target objective. The high degree of concentration in these two categories, together with their crucial importance to most other economic activity, make it seem likely that they might receive high priority in an enemy attack. Petroleum refining has only about a 25-per-cent reserve capacity—much less than most manufacturing industries. (Refineries normally operate around the clock and thus do not have the opportunity for expansion by multiple-shift operation.) In addition, there is a hazard of damage or loss from the abandonment or improper shutdown of plants not actually suffering attack damage. This could be guarded against by providing properly sheltered control centers for employees essential to emergency shutdown. Another method might be the use of automated emergency shutdown procedures, backed up by appropriate emergency power supplies.

#### Reduction of Demand

On the demand side, protection against industrial shutdowns resulting from postattack shortages of lubricants might be met by stockpiling. Shortages of gasoline would probably have to be met by rationing, mostly of individual consumers. There is a range of 9 to 1 between the top fifth and the bottom fifth of the population in per capita consumption of gasoline. If those who now consume more than the average were limited to the average level, demand would be cut by 45 per cent. Per capita consumption in the 1930's was only about one third of the current level.

The potential vulnerability of ports and their location near population and other targets make it plain that we should not expect imports to relieve our postattack bottlenecks but, rather, that we must expect new bottlenecks as a result of sharply curtailed imports. Fortunately, our national strategic-materials stockpile, much of which is relatively well protected from attack, would meet many of the shortages which would result from curtailed imports.

We find that motor vehicles and other transportation equipment, instruments, and apparel would be likely to suffer greater than average loss of capacity, because of their concentration in large cities. Apparel we can certainly improvise, since textiles would be subject to much less than average loss. The motor vehicle industry has substantial reserve capacity. Further, there is a tremendous spread—14 to 1—between the purchase of motor vehicles by the top fifth and the bottom fifth of the population. If we were to cut motor-vehicle purchasing per family to the current average rate, we would cut total demand by 50 per cent. A much greater reduction in demand would be feasible without seriously jeopardizing over-all economic recovery. Per capita purchases in 1932 were less than one fifth of the current rate. Instruments might be more of a problem; there is currently no good basis for estimating either the postattack demand or the amount of reserve capacity. We do have figures for electrical measuring instruments; the reserve capacity is over 500 per cent.

Other industrial categories in which there would probably be increased postattack demand, coupled with about average loss of capacity, would be industrial machinery, machine tools, and primary metals. All of these industries appear to have ample reserve capacity to meet the probable increased demand.

#### The Task Ahead

We need to study in much greater detail the degree of concentration in target areas, the availability of reserve capacity, and the probable postattack demand for many essential products produced by highly specialized industries. It is likely that some of these industries will be found to be prospective bottlenecks, and it may be possible to relieve the situation by stockpiling their products in advance. This is now being done for medical supplies and some other products. Other measures include offering inducements for plant dispersal or for making plans for rapid postattack conversion of related industries in which problems are anti-

pated. At this point there does not seem to be any reason to expect that any problems will be found which could not be overcome at reasonable cost by some appropriate combination of preattack and postattack measures.

Restoration of an integrated transportation system would be essential both for immediate survival and for long-range recovery. Postattack demands for transportation will be greater because of the dislocation of producer-supplier relationships. However, the surviving rail, truck, and inland waterway vehicles should be adequate to handle the traffic once the routes are restored. The principal obstacles will be damaged bridges at or near major cities, which will interrupt or impede all forms of transport. War-game studies of a variety of specific attack patterns have shown that these obstacles can be removed, repaired, or circumvented within a few months to the extent necessary to permit all main routes to function. Some loss of efficiency and increased mileage would of course result.

We need to develop and implement an aggressive program of preparedness for possi-

ble nuclear attack. Such a program should include systematic investigation of the range of possible economic bottlenecks which might occur and appropriate advance action of several kinds to overcome them. The largest single task is a national shelter program to preserve life—a program which must include a substantial proportion of blast shelter as well as fallout shelter. The needed programs should not require public or private expenditures which would substantially jeopardize prospects for long-range economic growth. In fact, they might enhance them.

If we develop and implement such preparedness programs, it should be possible to establish, within a few months after a nuclear attack, a level of economic activity which would support a standard of living equal to or better than that of the thirties—about one half of our present level. It should also be possible, if we exercise reasonable restraint in the first few years and devote a relatively large share of our output to capacity expansion, to return in about a decade to a standard of living approximately equal to that which we enjoy today.



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AMERICAN MANAGEMENT ASSOCIATION, INC.

1515 BROADWAY • TIMES SQUARE • NEW YORK 36, N.Y.

**THE RÔLE OF NONMILITARY DEFENSE IN  
AMERICAN FOREIGN AND DEFENSE POLICY**

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**REPRINTED FROM POLITICAL SCIENCE QUARTERLY**

**VOL. LXXIV, No. 4, DECEMBER 1959**

**NEW YORK  
PUBLISHED BY THE  
ACADEMY OF POLITICAL SCIENCE**

**1959**



## THE RÔLE OF NONMILITARY DEFENSE IN AMERICAN FOREIGN AND DEFENSE POLICY

**W**HILE Russia's ostensible military objective is defense of the motherland, her political objective is the destruction of the capitalistic systems of the world. From the Russian point of view, this latter objective is the correlative political goal of war. In this article it will be shown that the preparation of adequate American nonmilitary defense is not only important for the prevention of war with the Soviet Union and the winning of such a war if we are forced into it, but also of major significance in the calculation of Russia's chances of destroying the American economic and political systems if such a war occurs.

Anyone who has examined carefully the nonmilitary defense of the United States must be most sympathetic with those working on what is in fact a massive complex of problems. These problems are as complicated and interdependent as are the American economic, political, military and social systems themselves. The oft-repeated criticism that the nonmilitary defense program is little more than the issuance of statements of good intentions is not well founded today. Recent developments, particularly since the combining of the Office of Defense Mobilization with the Federal Civil Defense Administration, justify a somewhat more optimistic view.

Some of the difficulty of the public in assessing this effort stems from a misunderstanding of the real mission of nonmilitary defense. This mission is more than a combination of resources mobilization for fighting a World War II type of war with the civil defense function of protecting lives. Today's mission is no less than the preservation and continuation of the United States under conditions varying from the current Cold War through a Korean type of conflict to a limited war with nuclear weapons and ultimately to a ferocious massive nuclear war. Today's most compelling necessity is to accomplish this mission, not only if the United States is to survive war but also if its military policy is to be effective and its foreign policy believable and effective in the preservation of peace.

The National Academy of Sciences, in a recent report,<sup>1</sup> stated that an adequate nonmilitary defense would involve planning and programming in: (1) the management of facilities and manpower of the country; (2) preparing for the preservation of our political and economic institutions after an attack; (3) meeting the social and psychological demands for surviving the disruption of an attack; and (4) establishing a broad, economic basis for long-range peacetime reconstruction and progress following attack. This would include such diverse matters as public morale and behavior; continuity of government; relations with other nations; reconstruction of banking and credit systems; stabilization of prices and wages; rationing of foods, goods and shelter; maintenance of income; rehabilitation of destroyed plants; production of items basic to national survival; post-attack movement of people; provision of relief to the injured, displaced and unemployed; and management of resources. These are multidimensional problems; in considering them we must think not only of how they can be solved but also of when, and of the order of priority in which they are to be placed.

All who have given serious study to this problem—the Gaither Committee, the Rockefeller Committee, the National Academy of Sciences, the National Planning Association, and innumerable government and government-contractor study groups, including the RAND Corporation and Stanford Research Institute—have stressed the necessity of a sound and continuing nonmilitary defense as essential to America's military defense. That little has been done about this is due not only to the complexity of the problem but also to the failure to understand the ultimate bearing of nonmilitary defense on our military strategy, on the exercise of our foreign policy, and eventually on our capacity to determine national policy affirmatively and to impose our national will.

The goals of our foreign policy are to preserve peace and "our way of life." These goals require us to present effective resistance to overt military aggression from our enemy's present capacity and from his possible future capabilities. The preservation of peace and probably of civilization as well rests on the calculated, intelligent and daring use of spiritual, political,

<sup>1</sup> *The Adequacy of Government Research Programs in Non-Military Defense*, 1958.



psychological and military force. This includes the capacity to wage varying types of war successfully.

The only legitimate function of the military enterprise is to support the execution of national policy. The Clausewitz statement, "War is a continuation of policy by other means," emphasizes the only justifiable use of military force. Though this has been reaffirmed recently—for example, in the British White Paper of 1957—the slogans of World Wars I and II such as "total war", "victory" and "unconditional surrender" have at times become in some minds goals in themselves. Today's slogans are equally meaningless. "Two scorpions in a bottle" and "mutual annihilation" describe a policy of mutual suicide, a policy which neither we nor the enemy can logically adopt.

The fact is that there is considerable confusion between our national goals and the proper and justifiable use of military force. It has been stated that no comprehensive study of the whole military function has been undertaken for over one hundred years and it is interesting to note that it is the Air Force, in a little-known report,<sup>2</sup> which now proposes an examination of the entire military enterprise and asks whether the weapons which we brandish are the kinds that can exert the optimum international influence. Here the questions are raised as to what constitutes military advantage, what constitutes victory, and what are the limits to meaningful military power.

American military strategy now consists in maintaining a variety of forces that are designed for use in the different situations that are most likely to arise. It has been described in the popular press as the maintenance of forces for "limited war", for "massive retaliation", and for "graduated deterrence". The last term is attached to the doctrine that we should make ourselves able to fight both a "total war", which will be unlikely to occur as long as we are ready for it, and a "limited war", which is very likely to occur.<sup>3</sup>

The international strategic and economic-political implications of "massive deterrence" are many. The more we emphasize the use of nuclear weapons and reduce conventional weapons, the more we indicate to the enemy that we are not going to use

<sup>2</sup> "Development Planning Note", 58 DAP 2, by the Research and Analysis Division under the Deputy Chief of Staff, 1958.

<sup>3</sup> See Robert Strausz-Hupé, "Back to Sanity", 84 *U. S. Naval Institute Proceedings* 23, May 1958.



the latter. If we emphasize the total war concept, we may induce our allies to reduce their contribution of men and conventional weapons. The more we emphasize the use of nuclear weapons, the more we are placing ourselves in the position of having to use them or to back down from our stated policy. Once we have backed down, is it not probable that we will have to back down in future cases? If we use our nuclear weapons in such cases, we have initiated nuclear war; if we hold firm and wait for the enemy to launch a nuclear attack on our homeland, we may be destroyed.

On the other hand, emphasis on conventional weapons in the face of the enemy's development of effective capability for delivering nuclear attack invites destruction in war and nuclear blackmail in peace.

The theory of graduated deterrence which calls for preparation for massive nuclear war is, of course, most difficult to apply in real situations. NATO's function is to inhibit the adventurer and to prevent, if possible, a situation arising where we or the enemy would be forced to use nuclear weapons. If this fails, the questions are many. Can nuclear war be confined to Europe? Are nuclear weapons of any value in South East Asia, Africa and the Middle East? What of the danger of radiation to friendly and innocent peoples?

There are no easy solutions to these massive military and political problems of our times. But one proposition is clear—we must retain the capacity to wage total war. We cannot stop with any combination of forces that does not include real capacity to destroy the enemy; and if this capacity is to be real, not only must it exist as a military fact but both our enemies and our allies must know that it is a fact. Nor is it enough even that both our allies and enemies know that the gun is loaded, they must know also that we have the national will to fire it. Therefore we need to look not only at the military capacity of the United States but at the type of war the American people and the American economy are prepared for or can be prepared reasonably to wage.

The key to defeating an enemy lies in the destruction of his will to wage war. Our own strategy of deterrence is based squarely on the enemy's fear of massive destruction. This, we argue, prevents his attack. If we turn this proposition around to the United States, we then have the problem of brandishing

the sword without buckling on our shield. If we find ourselves in a crisis that is acute, but in which no bomb has yet fallen on American soil, the question arises whether we will have the will to order an all-out attack on the enemy in the face of the certain destruction of many millions of Americans.

Or look at it this way. If we assume that our military power is superior or roughly equivalent to that of Russia's at any given time, then we have reached what may be a significant and possibly, under some circumstances, controlling factor in the launching of an attack on either side: a realistic appraisal of the comparative ability of the Russian and the American populations to survive a nuclear interchange better.

Here there are many factors to be weighed such as Russian attitudes toward human life, the greater dispersal of Russian cities and of buildings within cities, and generally the more primitive level of Russian life, including more primitive methods of carrying on agriculture and mining, and the lower development of water supply and minerals. These we have generally considered as limiting the Russian capacity to wage war. If, however, these factors are looked upon as they relate to survival under primitive post-nuclear attack conditions, then they may be positive factors in Russia's favor. Take Soviet and American agriculture, for example. With 30 per cent more acreage, Russia's production is about one-half as great as ours and her output in animal products was about one-fifth of ours in 1956. The availability of tractor power is only 15 per cent as high as ours, truck capacity only 11 per cent as high, and electric power only 12 per cent as great. The quality of Russia's labor force is low. There are 50 million persons engaged in agriculture in the Soviet Union; two thirds are women, children and old people.

Although these factors of dispersed resources, limited mechanization, primitive transportation and a tradition of forced labor are limiting factors in the waging of a conventional type of war like World War II, they could very well become positive factors for survival, particularly when coupled with what is reported to be greater emphasis on shelters and other nonmilitary defense measures in the USSR.

What we are saying, then, is that the United States may very well need greater shielding because of its more advanced economy if it is to retain the capacity to take decisive military action and if it is to survive a nuclear attack. A failure to recognize



this fundamental need of the shield as well as the sword, of the castle as well as the knight, not only can be a hole in our theory of deterrence but can make our foreign policy ineffective to the extent that the enemy takes advantage of our reliance on it. This in turn weakens the chances of keeping the country out of nuclear war—the main object of our national policy.

Are we not driven to this same result if we take the other reasonable view open to the enemy? If we assume that the American military posture is believable and we know that our bases are essentially unhardened, that they are close to centers of civil population, and that our civil population is unprotected, this can be accepted rationally by the enemy as indicating that we are better prepared for offense than for defense. The enemy might therefore logically conclude in some future time of extreme tension that our vulnerability would make immediate attack on us less risky than further delay. Such a decision would be a result of measuring the gain, to be expected by both nations, from striking first against the loss to be expected from retaliation. Where delay would give us an opportunity to strike the first blow or improve our ability to survive an attack, the enemy might well conclude that self-protection required him to exploit the advantages gained by being the aggressor. Thus, the lack of an adequate nonmilitary defense program may heighten the probability of surprise attack on the United States.

It seems to me that three main courses must be followed:

(1) The massive retaliation concept must be strengthened and made more believable by hardening the Strategic Air Command bases and the missile bases so that, no matter how many aircraft and missiles are destroyed, there are enough left to destroy Russia. Further, these bases must be moved from close proximity to unprotected population centers or, as suggested by the Navy, our retaliatory forces should develop invulnerability through true mobility. Probably some combination of these concepts should be developed.<sup>4</sup>

It is suggested that the submarine-based Polaris is but one aspect of true mobility. Nuclear-powered aircraft as mobile missile launchers may soon be developed which could remain airborne around the clock. Such mobile striking power, in the war of the future, may offer the greatest hope of putting war

<sup>4</sup> See "Finite Deterrence, Controlled Retaliation" by P. H. Backus, *U. S. Naval Institute Proceedings*, March 1959, page 23.



back on the battlefield and away from the cities. To the extent that our weapons are located at sea, in the air or in outer space, the enemy will be forced to expend his weapons attacking ours rather than our homeland.

(2) While it is true that we must be prepared in some measure to meet a number of different hostile situations, we must, nevertheless, make an over-all determination of the war that we are most likely to have to fight and are most likely to be able to win. Having made that determination, our main effort must be to achieve maximum readiness for our task. Failure to make this determination and to take this action will result in diffusion of effort, blunting of the military instrument, and waste of material and manpower for civilian survival.<sup>5</sup>

(3) It must be made clear to our allies and to the Russians, beyond any possible misunderstanding, not only that America has the capacity to destroy Russia but that she can continue as a nation even through and beyond a nuclear war—a nation with economic and political institutions that are still American and with a standard of living that will be adequate within ten or fifteen years after a nuclear attack upon her. These last points are of great significance because in so far as they are true they remove the political objective of Russian attack, namely the destruction of the competitive free enterprise system. They are true, however, only if real work is done on nonmilitary defense, especially in the provision of fall-out shelters.<sup>6</sup>

Let us not forget, too, that the decision to unleash a nuclear attack or to stand firm against the threat of one is a political decision to be made by the President, not a military one to be made by the Joint Chiefs of Staff. So it is that an examination of America herself and the state of her war readiness plans must be undertaken.

In 1958, the National Academy of Sciences report<sup>7</sup> presented the conclusion that, while the national plans could be called adequate for the Cold War or a Korean type of conflict or for another World War II, they were grossly inadequate for nuclear warfare. Since this report was published, much progress has

<sup>5</sup> "Pick Your War—Then Plan for It" by James Baar, from *Missiles and Rockets*, August 10, 1959.

<sup>6</sup> See footnote 1, *supra*.

<sup>7</sup> See footnote 1, *supra*.

been made. A new National Plan for Civil Defense and Defense Mobilization is in existence. It is now only in the early stages of implementation, however, and it is much too soon to attempt any judgment on its adequacy.

Certainly it is clear that we must do more than make America ready for another conflict similar to World War II. Our problem is nothing less than that of how to keep the United States going as a living enterprise. This is an economic problem, a legal problem and a political problem. This is the ultimate and unbelievably massive problem that must first be recognized and then grappled with if the United States is to be capable of making up and enforcing its national will in a world full of grave danger to its national life.

To solve that problem we must abandon some concepts and assumptions that are fundamental in American political and social thought. For example, we cannot assume that the executive branch of government will be able to exercise central control and management in the period after attack. Instead, plans must envisage the possibility that executive authority will be wiped out for long periods of time because of breakdowns in communication and transportation. Such government as may exist will be on regional and local levels. It is very questionable, too, if we should assume that existing political and geographic divisions are a rational and realistic base for planning or that the present structure of government and separation of powers could be maintained in the event of total war. In making plans, we must assume a serious breakdown in procedural, technical and personal communications and coördination. Indeed, we cannot make plans on the assumption that either communication or transportation will be available in any degree for a considerable time.

Moreover, the assumptions on which we base our preparations must not be so rigid and restricting as to make our plans unworkable if the events that do occur are different from those that were expected. For example, plans cannot safely be based on the assumption that there will be a single massive attack without follow-up strikes and invasion. Nor is it enough to plan for enemy use of nuclear weapons alone. It is necessary to envisage attacks by nuclear weapons combined with biological, chemical and psychological warfare, sabotage and economic blockade. Plans must envisage the use of techniques of war that are not now employed. In the economic sphere, finally, we must

avoid making plans on the assumption that those who survive into the period after the attack will have the same needs and desires as are present in a peacetime economy.

While these ideas are accepted at the highest levels in most current federal planning, they are still not widely understood; and very little has been done so far to implement them in such a way as to achieve real readiness for attack.

What we are saying, then, is that America must be hardened so that if nuclear war comes and millions are killed; if millions more are sick and dying of radiation exposure; if the nation is fragmented into islands of survival with remnants of federal and state and local authority, here a Naval District Commandant, there a member of the Federal Reserve Board; if food, power and transportation are inadequate; if commands are confusing and conflicting and come from enemy as well as from American authority; if invasions occur or are expected; if final annihilation is expected momentarily by those who have thus far survived—then the incredibly difficult mission is not only for the military to prosecute the war successfully, but for the civilian survivors to pull the United States together and start the long process of rebuilding it segment by segment into a nation.

Safety, I believe, does not lie in abandoning our capacity to wage nuclear war but only in improving it, in making it more real, in making the threat a greater factor in our foreign policy and in the capacity to enforce our national will. This requires vast courage to lead us to face up to a danger greater than any in our history—to lead our political, business, labor, educational and scientific leaders to insist on today's sacrifices to harden America to provide better for her national survival. This is today's business! Any thought that hardening can be undertaken during a period of limited war or even of heightening national tension is unrealistic. This will be the very time that "digging in" will be resisted because of the danger of doing anything which, in the minds of American political leaders, could cause a limited war to flare into a massive nuclear war. The obligation to harden America is our obligation today. To meet this obligation, America must produce a quality of leadership first developed in the founding of the Republic itself. Let us hope that we have it today.

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# Apathy and Defense

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Reprinted from **ADVANCES IN CHEMISTRY SERIES**, Number 26  
"Nonmilitary Defense" pages 8-14  
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## Apathy and Defense

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The relatively new concept of an adequate nonmilitary defense for individual citizens is related to established concepts of American foreign and military defense policies. Of concern is a lack of comprehension, and hence public apathy, concerning the nature and scope of the military threat, including CBR warfare, and the nonmilitary defenses that can be established for and by individual citizens. This apathy arises from the complex nature of the problem and the psychologically difficult adjustment of accepting the casualties and destruction that could result for an unprepared nation. Yet there is no need for unpreparedness if the information needed for public understanding is provided and the obligation of the Government and knowledgeable people to provide leadership is recognized. Such defenses may be a positive force toward the peaceful solution of international problems.

I am not a scientist, certainly not a military expert, nor anyone claiming any real grasp of mid-20th century America. Like most Americans, I know very little about the Russians. I speak only for myself. My role is the one of the curious observer who, by the turn of events, has been exposed to much expert knowledge and listened carefully.

It is in this role that I should like to discuss what is called public apathy toward defense, more particularly toward its own survival in this era of nuclear and chemical and biological weapons.

Before getting into this rather deadly subject, I should like to repeat a pithy remark of a Bostonian friend who, when I mentioned the subject of the talk at one of our clubs, said, "On the subject of civilian defense, I *seethe* with apathy."

In casting about for an introduction to our discussion, I went back to the opening lines of Lincoln's House Divided speech delivered before the Illinois Republican State Convention in Springfield, Ill., June 16, 1858. Then a citizen, looking at his times, Lincoln said:

If we could first know where we are, and whither we are tending, we could better judge what to do, and how to do it.

Where are we and whither are we tending? Today this task is even more formidable than that faced by Mr. Lincoln 102 years ago.

### American Policy

Let us take a quick look at American foreign policy and general strategy, including our defense posture and the relation of nonmilitary defense to our foreign and military policies.

America's policy is to preserve peace, to extend the rights and liberties of free men, and to maintain the United States as a powerful, independent nation capable of freely exercising her will. To achieve these goals we must present effective resistance to overt military aggression from our enemy's present capacity and from his future capability, whether this aggression be by covert attack, creeping aggression, or nuclear blackmail. We do not speak here of our estimate of his future intentions—a questionable and precarious enterprise at best.

This policy toward the Soviets is based on the Kennan theory of containment. It was put into practice with President Truman's plea for American Aid to Greece and Turkey. Kennan argued that the Russian leaders were motivated by an ideological concept that the outside world was hostile and by the geographical fact that the Russian homeland was a vast and defenseless plain. Historically her leaders feared penetration from the West. The Marxist-Western conflict served only to buttress long-held fundamental military and political theory. Therefore, Russia's political behavior has been to push consistently into the outer world. Her leaders, however, have not been in a hurry about this, and caution, circumspection, and deception are the qualities favored. Russia has been willing to attack, retreat, wait, and attack again and again. This ability of the Soviet's to lay out and follow such a long-range plan of retreating where necessary and advancing at any sign of weakness required the West, according to Kennan, to maintain a total counterforce against constantly shifting geographical and political points. Such a policy must be long-term, firm, and vigilant containment.

To maintain this policy and its subsequent modifications, the United States has instituted various economic countermeasures and has entered various military alliances.

The United States has also developed a complex military strategy, the function of which is to support our national policy. This consists of maintaining a tremendously powerful variety of forces that are designed for use in different situations most likely to arise. These are forces for "limited war," for "massive retaliation," and for "graduated deterrence."

The international strategic and economic-political implications of these varying strategies are many. To the extent that we emphasize the use of nuclear or chemical and biological weapons, the more we are likely to place ourselves in the position of having to use them or back down at the next crisis, and the less well prepared we may be to fight a "limited war." On the other hand, to emphasize conventional weapons in the face of the enemy's effective development of her capacity to deliver nuclear attacks on our homeland invites destruction in war and nuclear blackmail in peace.

In other places and at other times I have argued that a significant and possibly, under some circumstances, controlling factor in the launching of an attack on either side or in standing firm against the threat of attack would



be a realistic appraisal of the relative capacity of the Russian and American populations to survive a nuclear interchange (1). Such an appraisal requires a comparison of many factors, including Russian attitudes toward human life, the greater dispersal of Russian cities and of buildings within cities, the generally more primitive level of Russian life, the use of forced labor, and the greater development of civil defense in Russia, where millions of people have received some training or have been instructed in first aid and have a rudimentary acquaintance with the tasks that have to be performed after attack.

Our tremendous military might surrounding Russia, when coupled with inadequately hardened SAC bases and an unprotected American population, can lead to other dangers.

From the Russian standpoint that may lead to the conclusion that the United States is vastly better prepared for offensive rather than defensive action. The enemy might therefore logically conclude, at some future time of extreme tension, that United States vulnerability poses a fleeting opportunity for immediate attack. Further delay would increase the probability of failure. A decision to strike first would be a result of measuring the gain, to be expected by both nations, from striking first against the loss to be expected from retaliation. Where delay would give us an opportunity to strike the first blow or improve our ability to survive an attack, the enemy might well conclude that self-protection required him to exploit the advantages gained by being the aggressor. Thus, the lack of an adequate nonmilitary defense program may heighten the probability of surprise attack on the United States (1).

I am completely convinced that today any real distinction between military and nonmilitary defense is meaningless. The effectiveness of our military forces may well represent unacceptable risks to an aggressor, but the real possibility of multimillions of American casualties hampers and blunts the use of our military forces and of course automatically our foreign policy. While we have done a magnificent job in the improvement of weapons and our efforts in the nonmilitary defense area have been improving under Governor Hoegh to the place where we have a national plan, this improvement has not resulted in attack readiness which gives the people a fair chance for survival.

A shelter program, including protective devices against radiation and chemical and biological weapons, is clear evidence that we are defense-minded, not offense-minded. To a rational, calculating enemy, a strategy of striking first is consistent with vulnerable bases and unprotected population. The better we are prepared to withstand attack, the more tangible the evidence that we do not plan a pre-emptive attack.

#### **Adequacy of Nonmilitary Defense**

What do we mean by nonmilitary defense? and what are its inadequacies?

The National Academy of Sciences (5) has stated that an adequate nonmilitary defense, in addition to providing warning, shelter, and certain physical defense for the people, would involve planning and programming in (1) the management of facilities and manpower of the country; (2) preparing for the preservation of our political and economic institutions after an attack; (3) meeting the social and psychological demands for surviving the disruption of an attack; and (4) establishing a broad, economic basis for long-range peacetime reconstruction and progress following attack.

We should admit here that an adequate program of nonmilitary defense

would be costly, but hardly prohibitive. We should admit that it would become obsolete, but all military devices become obsolete. We should also consider the danger of heightening international tension by America's "digging in." Here, too, I believe there is a basis for concern. But we should feel no more concern for this than we do in the development of newer and greater weapons. Both sides, I believe, will adjust to the other's digging in, as we have adjusted to new weapons. If such civilian protection will, in fact, reduce the chances of war, I believe it a fair chance to take. If we do not make preparations now, we will not in a period of heightening international tensions.

The NAS report stated that our preparations, while adequate for another Korean War or a World War II type, are woefully short of approaching the type of war that militarily we are preparing to fight.

What has not been appreciated and has apparently gone by almost unnoticed is the change in the importance of nonmilitary defense to military and political decisions. Thus, in the days of the pre-eminence of the manned bomber and the smaller weapons, the absence of an effective civil defense, though serious, was not a catastrophe, because civil defense was not the controlling factor. Today, as we enter the missile era with its vastly more devastating weapons, nonmilitary defense may in fact under some circumstances have become controlling. Its inadequacy and the resulting time lag in national planning could assume awesome significance if we are called upon to face up to a great military crisis in the near future and we have not taken adequate measures to protect the people.

Now it is against this background that many competent American observers report America is apathetic. James B. Conant says (3):

Yet, as I have traveled around the country during the last two years, with few exceptions I have sensed no awareness of the nature of our peril. For the most part, I have encountered little but complacency. . . . There is in certain circles an unwillingness to agree that there is an urgency today which is a consequence of our struggle with the Soviet Union, a reluctance to talk in terms of the national need . . . . The high degree of complacency of which I speak is compounded, in a curious way, with despair . . . . One difficulty involves the nature of the struggle; the other is a consequence of the terrifying nature of new weapons.

Conant and Morgenstern (4) hit at what to me at least are the great causes of American apathy:

The unbelievable complexity of the problems.

The horrendous nature of the problems, which makes them difficult of personal and public acceptance.

The defense of the United States, including the protection of citizens to the fullest possible extent against new and deadly weapons, is the greatest and most complex problem that this nation has ever faced. It is what Professor Morgenstern identifies as that "enormously complex field of politico-military-technological life, where aims and means are so poorly described and the unexpected turns of events continuously add new facets to an already bewildering picture."

And, as has been said frequently, the determination of the use of nuclear weapons and biological and chemical weapons in all of their political, diplomatic, military, and technical aspects is a much more difficult matter than the invention and development of such weapons. Yet not a fraction of the in-



telligence and competent effort has been put into the consideration of the use of such weapons as was and is put into their development.

In fact, even a segment of the problem—the military problem, for example—is so massive and complex that our best professionals, dealing with their own segments of the military problem, have difficulty in advising the Congress upon the choice of weapons and strategy. It is much too easy an answer to dismiss this conflict among the chiefs of our services and their scientific advisers as service rivalry.

More properly, I believe that varying views on military strategy are merely symptomatic of the position that the most enlightened expert must find himself in. When the political-diplomatic dimensions are added to the military-technological ones and then in turn to the difficulties of supplying a reasonable chance for survival of a fair proportion of the population and to the management of the nation's resources under conditions of attack, we have a series of problems that, if they can be understood at all, certainly can be worked upon with any hope of the development of solutions only through the tremendous and sustained effort of persons of great training, intellect, and devotion. Needless to say, all of this is complicated by the real need for military secrecy.

These great national matters cannot be left to the unguided "common sense" of anyone and certainly not to the common sense judgment of the citizen. He cannot expect to work his way through to the point of understanding the nature of these multidimensional and multiphased problems. As Morgenstern says, "The power to participate in any detail in the process of political or military decision vanishes to practically zero for the ordinary citizen, a serious matter for the survival of a living and meaningful democracy."

Now to charge the American people with apathy to a great danger and indifference toward their survival under these circumstances is rather meaningless.

The second great cause of American apathy is a result of the fact that if we as American citizens take the threat seriously and, in fact, act upon it—specifically if the people build public and private bomb shelters, provide themselves with dose rate meters and dosimeters, take preventive action against CEBAR weapons, store food and water, raise taxes for these purposes, and give tax credits for preparation—this is a public and a personal admission to ourselves that the problem is real, that it exists, that it exists on Main Street and in the thousands of miles of urban complexes and on the farms. This is to admit to ourselves as human beings, alive with all of our personal goals and aspirations for ourselves and our children, that the threat is here, that it is real, and that it affects us possibly more than any other single factor in our lives. As T. E. Eliot has said, "Human kind cannot bear very much reality."

America has not fought a war on her soil for one hundred years. To act for survival today is to admit the possibility of destructive war on American soil, of a blistered land and starved people, of want, and of millions of Americans dead and homeless. Russia, which in World War II lost population estimated at from 30 to 50 million persons and had much of her country destroyed, would, I believe, be more able to accept the reality of war at home. The development of weaponry by the United States to destroy an enemy thousands of miles away is quite a different thing from building bomb shelters in back yards.

A *New York Times* reviewer comments on certain reactions to the moving picture "On the Beach." He says many authorities have lashed out against this



film, some for its failure to advise the public "reassuringly" that it is possible to defend against radioactive fallout. He quotes an editorial in the *New York Daily News* as charging the picture with being "defeatist" and saying that it "plays right up the alley of (a) the Kremlin and (b) the Western defeatists and/or traitors who yelp for the scrapping of the H-bomb."

Or look at the *Times* editorial for February 28, which comments on the fact that while we shudder at the violent deaths of a few people in airplane accidents, we accept modern weapons with considerable serenity. It is opined that "emotionally we value human life more than any other generation before us. Intellectually, we contemplate a situation in which life might be worth hardly anything."

I believe the point to be a little different. The air tragedies are real—we do admit them and picture them to ourselves. The holocaust threatened by modern weapons is not—we do not admit its existence. In fact, we have what amounts to superstitious fear of acknowledging the reality of the threat. If we ignore it, who knows—it may disappear.

### What Can Be Done

We are now at that point where, in Lincoln's words, we must "judge what to do, and how to do it." Here, as is the case with most observers, I really have no answers. I do, however, repeat certain suggestions that have been made before:

We should not choose our homeland to be a battlefield, much less insist on it. We must exploit the unique advantage of a defender—the selection of the battlefield and the weapons and the forces that an aggressor must destroy. Thus, striking power must be truly mobile and the enemy forced to expand his weapons in attacking ours at sea, in the air, and in outer space rather than our homeland.

We must make an over-all determination of the war we are most likely to have to fight and develop maximum readiness for it.

In addition to keeping our military striking power updated, it is essential that our enemies and allies understand that America, through real defense readiness, including realistic civil defense preparations, can continue after attack and preserve American social and economic institutions.

It must be recognized in the highest quarters that to the extent we fail to protect as much of the population as possible to the extent possible against radiological fallout and chemical and biological weapons, we blunt the effectiveness of our military forces and we inhibit the development of a strong foreign policy.

### The Obligation of Leadership

But beyond these specifics we have a much greater obligation—the obligation of leadership.

I believe it to be the absolute duty of knowledgeable people in government, in science, in the professions, in business, in labor, and in the universities to take part in the framing of the issues of their time and to work toward their determination. If the issues are to be so framed that a democracy can act upon them, it is our obligation as public and private citizens to become informed, to participate, to propose, and to act.

While the ordinary citizen cannot be expected to understand in depth the foreign policy of his country or the development of its weapons systems, or

the complexity of a real nonmilitary defense, he and his fellow citizens must understand that the American population must have a maximum chance of survival if America is to continue as a great force in our time. He must understand the broad issues of war and peace and of survival and annihilation if the United States is going to act with force and intelligence and unity. On these broad issues the American voter cannot trust others to look out for him. The issues of survival are not pleasant ones. They do not partake of the fuller life or of doing nice things for people. They do not appeal to the self-centered interest of any particular class of voter, nor to the aged, nor to the indigent, nor to labor, nor to management, nor to the farmer. Some people even doubt if their discussion is in good taste.

The situation here, I am told by an eminent psychiatrist, is not dissimilar to that facing students in medical school the first time the class in anatomy enters the morgue. Little anatomy is studied until the students become used to death.

In the past some of our leaders have done remarkably well in framing the issues for the country. Lincoln, in his House Divided speech—the one we have been quoting today—which was then thought to be political suicide, and Wilson in his League of Nations proposal, which ended in tragic failure, demonstrated the courage required in putting the real issues before the people.

We are most fortunate that this is a political year, the year of political attack, of political criticism, and of political defense. We are fortunate because probably these issues can be raised only in a political context. How they are handled by the Administration, by the Congress, by the military, and by scientists will be of crucial importance to our society. To the extent that they are *not* presented with candor, with fairness and with realism—to that extent America will not be made safe and the democratic process will not function.

Let it not be said of us tomorrow, as Churchill said of yesterday (2), "No one in great authority had the wit, ascendancy, or detachment from public folly to declare these fundamental, brutal facts to the electorates; nor would anyone have been believed if he had."

As our leaders rise above the surface problems of a political year to those of survival, of war, and of peace—to that extent will America respond and apathy dissipate. To the extent that our leaders advocate present necessary sacrifices for our survival today and for our children's survival tomorrow, America will respond. *All* Americans will respond.

It is in this framework that the need for open discussion of the nation's policy toward protection of its people against radioactive fallout and against chemical and biological weapons effects must be placed. This is the only way our democracy can work. It will then be possible to judge better what to do and how to do it. Let America carry the terrible responsibility of preserving civilization in our times, that fate has placed upon her with a fully informed citizenry, educated by responsible discussion of the broad issues of war and peace, of survival and annihilation.

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preciate it if you at your convenience would prepare a bill, you are a lawyer—prepare a bill exactly as you would have an individual Member of Congress submit that bill.

I think it would be very helpful.

Mr. BRAY. Would the gentleman yield?

I believe that is what you refer to, suggested revisions of public law, then you give title I.

Does that include all the suggestions that you are contemplating?

Mr. LEVINE. Well, this was written 7 years ago.

Mr. BRAY. I see.

Mr. HÉBERT. I think, write it as what we would call a clean bill.

Mr. LEVINE. A clean bill?

Well, you compliment me by making the suggestion to me. I want to say something about Mr. Pittman, I think it should be said, and said publicly.

From what I see of Mr. Pittman I think the country has a very able, competent, and deeply dedicated man.

I have never seen a man work as hard and work as devotedly to the job. I think he knows civil defense. But I think Mr. Pittman or any civil defense director is greatly handicapped by the powers and the authorities that you gentlemen have given him back in 1950.

And I am here as a citizen and I am here to help and I certainly will accede to your request.

Mr. HÉBERT. That is the reason we are here, this is the first broad hearings that have been held on the civil defense program.

As you notice the gates are wide, the range is wide, and the latitude is limitless, what we are discussing, because we want to get a firm picture and come up once and for all, certainly for the moment, with a sound program if we are going to have a program at all.

Mr. LEVINE. I am with you 100 percent.

Mr. HÉBERT. Thank you.

Mr. COHELAN. No questions.

Mr. HÉBERT. Thank you very much, Mr. Levine.

The committee stands in recess until 2 o'clock.

(Whereupon, at 12:05 p.m., the committee was recessed, to reconvene at 2 p.m. of the same day.)

#### AFTERNOON SESSION

Mr. HÉBERT. The committee will be in order.

Mr. KELLEHER. Dr. Teller, Mr. Chairman.

Mr. HÉBERT. Doctor, we are very happy that you have taken the time to come before us today and we welcome you here before the committee. You may proceed in any manner you desire and after you finish your statement the members of the committee will avail themselves of asking the questions that they desire to ask.

#### STATEMENT OF DR. EDWARD TELLER, NUCLEAR PHYSICIST

Dr. TELLER. Mr. Chairman, gentlemen, I have submitted to you a very brief summary of what I have to say. I should like to use a few minutes to expand the statement.



I also have brought along, for the use of the committee, documents describing a completely private project, an adequate project in which a small number of families in Livermore, have tried in a reasonable manner to provide for their own safety.

Recently a book has been published in Russia on military strategy. The editor of this book is Marshal Sokolovsky. The book discusses at great length, with many repetitions and in an aggressive and many times distasteful manner, the dangers of war.

I believe that this book has lessons for us, which we should not disregard. A very considerable portion of the book, and I don't want to talk about the book only insofar as it has to do with civil defense, a very great portion of the book is dedicated to the description of past campaigns in which the Soviet Union was involved.

In particular, the civil war in Russia, which followed the First World War, is discussed in detail. Similarly, in detail, you find a description of the Second World War and very particularly the beginning of the Second World War when Hitler's armies penetrated deeply into Russia. In both these cases the existence of the Soviet Government was deeply in danger. The book does not hide this fact. The authors take very considerable pride in having survived these two dangers. Civil defense is mentioned, seriously, with some emphasis, but not with great emphasis. But where it is mentioned, it is stated clearly that the experience of these two wars has convinced the Russians that they must prepare for future emergencies, make sure that the whole population is thoroughly prepared.

The book expresses complete conviction that in a next war—and they talk in a very dreadful way about this—in a scandalous way, calling the western nations, particularly the United States, aggressors—but, having said that, they then do not hide from their leaders that the next war, which they intend to win, will be a grim affair; as in the last two times, the book states the Soviet Union must be completely prepared.

I don't think you can read this book without being convinced that these sections are meant seriously, that defensive preparations in Russia are proceeding now. The book has not been written for your reading and mine; it has been written for many people, but primarily for the Russian leaders.

There has been other evidence, which the Russians don't particularly emphasize, that they, indeed, put some emphasis on civil defense.

Russia is a poor country, very poor, compared to the United States. If Russia will be prepared to withstand an atomic attack and we, who are rich and powerful, will not, this will go down in history as one of those peculiar states of blindness where—wherein great countries have ended their national existence because of lack of elementary foresight and wisdom.

Out of each defense dollar today we spend not more than one-tenth of 1 cent on civil defense. I am not here to tell you gentlemen that civil defense is easy, or that civil defense is cheap, but I am here to tell you that if something like 10 percent of our defense budget were devoted to civil defense, within a few years, in sufficient time, we could have enough defense so that the Russians will know

for sure that this way they cannot bury us. It atomic war comes, it will be a most dreadful affair. I am sure that all of us want to do everything to avoid it, but one of the best ways to avoid it is to be prepared for it because our opponents are determined, but they are not madmen like Hitler; they are cautious; they are calculating.

I would like to come very briefly to talk to you about one way in which shelters can be built. This is not the way which is under nationwide discussion. In your present considerations you refer to a much more modest program and I will come to speak of this program. I will not maintain for a moment that the program which you discuss today is sufficient. Those who have appeared before you and have said that this program in itself won't save us, are right.

If they continue by drawing the conclusion that the first step must not be taken because the goal is far away, then I will call such people defeatists. We will never reach the goal unless we take the first step.

But, let us first talk not about the complete description of the goal, but at least of a brief view of it.

The Naval Radiological Defense Laboratory in San Francisco has worked out a type of shelter. This shelter costs approximately \$200 per person on an austere basis, when it is built to shelter at least 100 people and preferably more.

It assigns to each person 11 square feet. It can be so constructed that it will withstand the most dangerous blast which is a ground-burst of a big weapon.

Specifically it will withstand a megaton at a distance from one mile. The principle of its construction is you dig a hole, put into it a quonset hut-type structure of yielding elastic steel, fill it up, cover it with six feet of earth, make it air tight, self-contained. Such a structure can withstand shock, will completely withstand fire or other types of chemical or biological attacks. It is amply sufficient for fallout. It cannot be used in every part of the country.

You have to have loose or easily excavated ground for some depth and there must not be ground water present in too great quantities at too high a level. It is not a universal solution. There is no universal solution, but it is a solution which fits the bill; it fills the bill in many instances.

A few years ago, when I was Director of the Livermore Branch of the Lawrence Radiation Laboratory, I proposed that for our protection and as an example, the Atomic Energy Commission authorize that in the additional buildings which they were building anyway, shelter space be provided. This request was denied. It made some people in our laboratory very unhappy, indeed.

A number of them got together in a private association called "Survival Associates." They built shelters, a shelter of which I have brought some pictures and some description along, which I would like to submit to you gentlemen.

The first picture shows the quonset hut in the ditch which is to be filled in later.

The second picture shows the survival associates standing around in the corridor of the finished shelter.

I have with me a description and a ground plan of this shelter which I will likewise submit to you for your records.



I will state that the shelter has been built for 34 families, 34 men, 34 women, and 82 children. The area in the shelter available per person is 23.6 square feet. This is a little more than twice as much as the minimum requirement in a really austere construction.

The shelter can sustain a little more than one atmosphere overpressure, whereas the one that I described to you can sustain seven. The additional pressure protection is not important in an area like Livermore, which is rather far from a prime target. The additional protection which is needed means a little thicker steel and will not change the price much.

The actual price in this case, which has provided more than twice the absolute minimum of the room, was \$329 per family. The amount is high; it is not exceedingly high.

I am submitting these papers for your inspection and for your attention.

(The documents referred to follow:)

UNIVERSITY OF CALIFORNIA,  
LAWRENCE RADIATION LABORATORY,  
Livermore, Calif., June 20, 1963.

Dr. EDWARD TELLER,  
Care of Wallace O. Brassford, Office of Civil Defense,  
The Pentagon, Washington, D.C.

DEAR EDWARD: Enclosed is a summary of the information on the Survival Associates Shelter and one print of the plan. I ordered, by airmail, some prints of the pictures last week. I hope that they arrive early enough so that I can get them to you. If they do not arrive, I will select some other pictures and send them to you.

Sincerely,

Duane  
D. C. SEWELL.

#### SURVIVAL ASSOCIATES SHELTER

I. *Organization.*—Survival Associates, Inc., is a nonprofit membership corporation.

II. *Land.*—The corporation owns 6 acres of land on the outskirts of Livermore, Calif., within 1-hour walking distance (3 miles) of all its members.

III. *Shelter Description.*—(One shelter has been constructed to date for 34 men, 34 women, 82 children.)

1. Main Structure: Armco multiplate arch.

(a) 25-foot span by 11-foot 8-inch rise by 142-foot long of 12-gage (0.1046 inch) corrugated steel.

(b) End walls—7-gage (0.1838 inch) steel bridge plank.

(c) Entrance (one on each end)—84-inch diameter 10-gage (0.1345 inch) corrugated steel pipe.

(d) Concrete floor 6 inches thick.

2. Interior sheetrock and 2- by 4-inch stud walls are not load bearing.

(a) Two cross walls divide the shelter into 3 approximately equal sections (1 for 10 families and 2 for 12 families each).

(b) Each section has a central room 9 feet wide running the full length.

(c) Each section has two chemical toilet stalls (2 by 4 feet) and one food preparation room (4½ by 7½ feet).

(d) Each family has a private room (approximately 7½ feet square) with a door opening onto the central room.

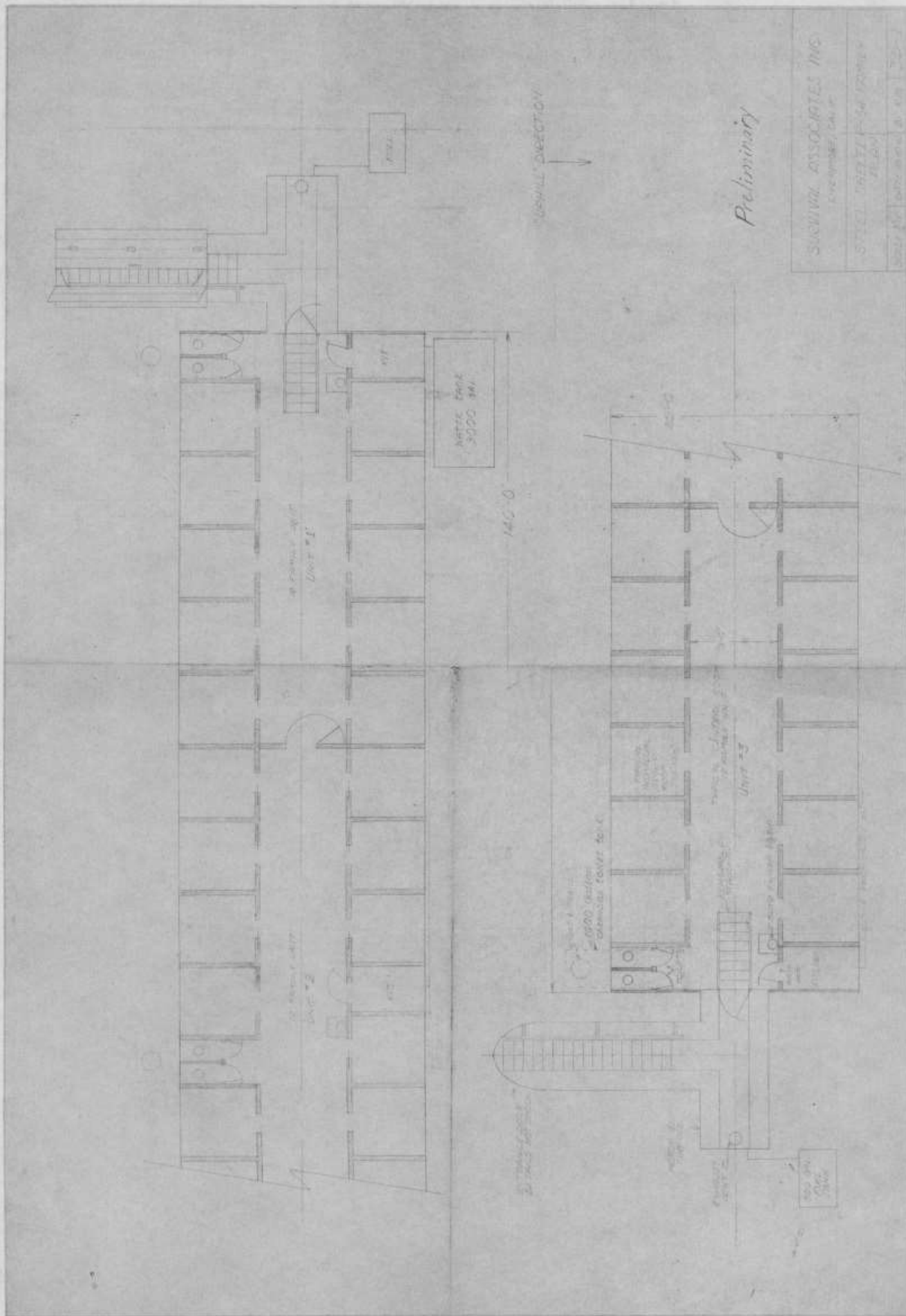
3. Area—23.6 square feet per person. Volume—215 cubic feet per person.

4. Two gasoline engine driven electric generators (5 kilowatts each) are mounted in separate rooms. One off from each entrance way. One generator is adequate for ventilation system, lights, and cooking. Six weeks' supply of fuel stored underground for each generator.

5. Two 3,000 cubic feet per minute squirrel cage blowers can be used separately or together for ventilation.

6. The main arch and entranceways are built to withstand 20 pounds per square inch overpressure. Additional supporting structure is planned to bring the observation towers and doors to this strength.





Preliminary

SUGIYAMA ASSOCIATES INC.	
ARCHITECTS, SAN FRANCISCO, CALIF.	
STILL TRELLIS	PLAN
Scale: 1/8" = 1'-0"	DATE: 10/10/68



7. The arch is semiburied with a minimum of 3½ feet of earth cover.

IV. *Costs.*—

1. Cost—\$1,382 per family (includes construction, \$1,215; equipment, \$120; supplies, \$47).
2. Operating cost—\$6 per month per family.
3. Land—\$329 per family.

V. *Supplies.*—

1. Basic diet of dry milk, vegetable oil, sugar, raisins, bulgar wheat, and vitamin tablets is provided for 3 weeks; 1,965 calories and 1 multi-purpose vitamin tablet per day per person (cost—16 cents per day per person).
2. 3,000 gallons of water are stored in an underground tank with gravity feed to the shelter.

VI. *Instrumentation.*—Radiation, O<sub>2</sub>, and CO<sub>2</sub> instruments are provided.

VII. *Tests.*—

1. Three tests have been run in which approximately 25 people each time have occupied the shelter for 12 hours (overnight and breakfast of shelter food).
2. One test has been run in which 95 people occupied the shelter for 36 hours (2 nights and 1 full day including 3 meals of shelter food).

Dr. TELLER. Shelters are not enough. We need a warning system. We need methods and training by which people will heed the warning system. We need provisions for recovery after an attack.

I claim that we can save the lives of our people, not all people. A sudden attack is likely to catch millions outside of shelters, and whoever says that we shall be overconfident once we have shelters is clearly out of his mind. A nuclear war would be a catastrophe that no one, no single person who has given serious thought to it, will set at an unimportant value.

A nuclear war will be the most terrible thing that can happen to us. But I claim that with adequate protection we can save everyone who is in a shelter and we probably can save 90 percent or more of our people. People will tell you, maybe have told you that if you make shelters the Russians will make bigger bombs. Maybe. We are always working and we should be working on missile defense. I am not one of those who believe that complete missile defense will necessarily succeed. It may fail. It may fail perhaps with a probability greater than 50 percent, but what do I mean by failure?

As far as we know, the enemy can explode nuclear weapons high in the air in such a way that it will destroy our cities and if we tried to shoot him down before he comes low, he will accompany his missiles with so many decoys that we won't know what to shoot at.

I am not underestimating the difficulties, but these difficulties can be solved in a good and important part and I have to ask your attention because here the details are of importance.

As the missiles and decoys penetrate the atmosphere you begin to see the difference because the decoys, in order to be cheap and plentiful, must be light and if they are light the atmosphere will stop them. As these objects come lower, we begin to find out which is which and we believe that before they approach to 5 or 10 miles at least soon as they have approached to 5 miles of the earth's surface, we will be able to shoot them down.

This I think is possible. At 5 miles these weapons will light fires, will destroy buildings, but will not destroy the shelters. We can make the shelters so that for any foreseeable attack against which we cannot defend in an active way, these shelters will be good enough.

It will be a big and hard undertaking. The Russians are working



on it. If we are not, we deserve to lose our liberties which we are not prepared to defend.

We can defend the lives of our people and with the lives and with our minds and hearts we can reconstruct everything for which we stand. It is an economic fact that the total national values added up together is equal to approximately 3 years of production. It is an amazing fact, but it is a fact. Our civilization is not in steel and stone; it is in our minds and in our hearts, and our knowledge how to work and to cooperate with each other and how to govern nature.

Sure if we start, we start with 10 bare fingers, it will take a long time before we get back to a decent state, but we can put the most important things into stockpile. We are fortunate to have 2 years of food surpluses. The Russians don't. If we but used a little money to distribute this food and put it into a form where it will be available to people in case of an emergency, at least we shall survive.

Today Iowa has 50 years of food supply and California 1 month of food supply and Hawaii will be in trouble even before that time. The problems are very great. We have not even studied them so far sufficiently. I say—and I am confident that they can be solved at the expense of 10 percent of our defense budget, but if you would vote that amount today, I would not know how to use it.

We need, at first, lesser amounts to make a sound and detailed plan. What I have shown you is evidence of a few people who do more for their country by giving an example than for themselves by protecting themselves because when everybody dies around them, they will not survive in the longrun either.

Our national body is one and we must protect all of it. You have before you a modest proposal, one that asks for food supply for provisions, for shelters that to a very great extent have been already selected. We try to save money by refraining from new construction and we are trying to use what exists. This will furnish protection against fallout if the enemy uses dirty bombs, and if he uses his weapons as groundbursts. He well may use them so. We don't know what he will do.

If this oldest and not improbable method of attack is employed, then the present small sums of money will save many millions, tens of millions of lives.

True, if another method of attack is used, further provisions will be necessary. This is what we can do right away, against an attack which is likely to become possible for the Russians at the earliest time. I shall never say that this is sufficient. I will urge you to go on from there.

One of the most important problems before all of us today is to bring into this country a clear realization that freedom and our form of government is something important, something we have to defend. If we listen to those who wrongly state that a next war will necessarily be lost, we might easily end up living on our knees and perhaps later dying in a war that others fight over our impotent bodies.

If we are prepared to defend ourselves, I believe war will never come. What you are doing here is a crucial engagement in this

overall fact. If the modest request for an elementary precaution is refused, further development of civil defense is apt to be delayed even further.

We still have time, we do not have much time. We have time because we are richer and we are stronger, but the amount of folly that the appeasers among us, the better "Red" than dead ones among us advocate, this amount of folly can compensate for any amount of material advantages.

I am deeply convinced that civil defense is necessary and that the modest request for the stocking of fallout shelters that is now before us is a measure which in the right and original use of the word is a sane measure.

Thank you very much.

Mr. HÉBERT. Thank you very much, Dr. Teller, for a very inspiring presentation of the subject and naturally the words that you speak carry heavy, heavy weight. I am sure the members of the committee have many questions they desire to ask you. I just have one or two and I will allow the members to ask you as many questions as they desire.

Do you have a shelter?

Dr. TELLER. Sir, I do not.

Mr. HÉBERT. You do not have?

Dr. TELLER. I do not. If I would find 100 people who live near to me with whom I could construct such a shelter, I would make one.

Mr. HÉBERT. In other words—

Dr. TELLER. I believe that we have to look into the shelter question in a joint manner. I, no more than anyone else, will or should stand in front of my shelter and deny to others. The question of shelters is not something that an individual by himself can solve. Cooperation between individuals can solve it. The Federal Government, the State government, the municipalities, associations of individuals can solve it. What you do can stimulate private initiative and formation of private groups to go ahead with it. Whether it be done in a Federal way, in a local way, in a private way, I do not know, but I believe that if I made a shelter for myself, I would not protect myself and those who want to contradict me would point a finger at me not for the present reason, but for the opposite one.

"He can talk about war, he has a shelter." I think we are in this together and if, for instance, there were appropriate legislation which would make it easy for private associations to make shelters, this would help me persuade the other 99 in Berkeley together with whom I would like to make a shelter.

Mr. HÉBERT. As I understand it, you have the philosophy that this proposed legislation is an indication or a guidepost on a community basis because these shelters are community, that we are discussing now, and in the Federal buildings, schools, churches, and other types of buildings—that this would be the inspiration or the leadership necessary to stimulate groups of private individuals to come into a building after community shelter.

Dr. TELLER. This would be one of its important effects. Another one is that the measure itself would provide in the present state, where the Russians probably are aiming at a number of hard points,



it would in all probability save lives in the unfortunate case that war should come soon. It is a partial measure and it is a measure out of which more measures, private or collective, can grow later.

Mr. HÉBERT. You addressed yourself in the beginning to a shelter which I understood to be a blast shelter?

Dr. TELLER. Excuse me?

Mr. HÉBERT. Is that correct, a blast shelter, a shelter against blast, quonset-type hut?

Dr. TELLER. I am addressing myself in the end to a shelter which provides protection against fallout, blast, and fire.

Mr. HÉBERT. Of course—

Dr. TELLER. Of the three, fallout is probably the most widespread. Fire can be almost as widespread, but probably will be not as widespread and in certain parts of the country and certain parts of the year it will just not get going.

Blast is the most immediate danger for our heavily populated industry—for our heavily populated urban regions. It is, in extent, the least of the three. It is reasonable to provide first protection against fallout because it is the most widespread and because it is by far the cheapest. So as a first step, it is the easiest to undertake.

Mr. HÉBERT. Now, I don't know whether you had the opportunity of reading the paper or the testimony given by Dr. Schreiber?

Dr. TELLER. I have seen it. I have not studied it. I would be happy to answer any questions about it.

Mr. HÉBERT. Well, if you have read it or know what he did testify before the committee yesterday, there is no need of me asking the question except for you to answer it because he said in effect that there was really no protection at all. He just closed the door.

I appreciated his testimony on the preservation of anybody at any—in case of an attack from fallout. However, since you have read the paper and are familiar with it, I would like your comment on it.

Dr. TELLER. I have read the paper hastily. I would like to say this about it, and I would appreciate your asking me more about it in order that I don't prolong the discussion.

Mr. HÉBERT. Knowing the committee as well as I do, they will ask questions. They will explore the whole field.

Dr. TELLER. I will say this: The fallout shelters which are now proposed are very useful, in case there is no fire and in case you are outside the blast area. This is likely to be the case in many locations.

If there is blast, many of these shelters will be completely useless. If there is fire, some of these shelters will be useless, not all of them.

The story of firestorms in the last war is a complicated and conflicting story. Many have died in the conflagration in—

Mr. KELLEHER. Hamburg?

Dr. TELLER. In Hamburg. Thank you very much for helping me out. There have been statements and I am not prepared to agree or to contradict them in many cases where people in the shelters would have survived if they had stayed in the shelters long enough, if they had not come out while the carbon monoxide or other products were still around.

I do not know. It is a difficult discussion. The shelters now proposed are not good against blast and fire. The shelters I am talking about are good against blast and fire. And whoever says that ade-



quate shelters cannot be constructed for a whole population does not know the facts.

Mr. HÉBERT. In other words, you do reject Dr. Schreiber's thesis or presentation or conclusions that they are useless?

To sum up in one word, you do reject his——

Dr. TELLER. I completely reject it.

Mr. HÉBERT. Completely?

Dr. TELLER. There is no point in saying that we cannot defend ourselves. If you take a 100-megaton bomb and put it right down on the surface and you are 100 feet under it in a deep shelter, you are gone, true enough.

But, first of all, if you are 4 miles away from it, you survive. And secondly, if we go ahead, as we intend to go ahead with missile defense, we will in my opinion prevent bombs from coming as low as 4 miles. And in this case a bomb aimed right at you will still not hurt you, provided you are in a shelter.

I do not know the background, the ideas, the motivations of every individual. But I do know that the judgment "there is no defense" has been passed without proper consideration of the facts.

And those who use their professional background to make such statements are deeply irresponsible.

Mr. HÉBERT. Mr. Fisher?

Mr. FISHER. Dr. Teller, it has been suggested that if agreement could be reached with Russia to suspend tests that there would be less necessity for our worrying about fallout shelters and other protective measures.

Would you care to comment on what effect we should give to a suspension of tests, if such a thing should be brought about?

Dr. TELLER. One effect would be this: If we suspend the tests and we, as an open country would indeed suspend them, we would not develop our missile defense. We could not do so in the complete manner in which such a difficult problem would have to be attacked.

At the same time Russian tests up to 1 kiloton could certainly go unnoticed.

Tests up to 1 kiloton are sufficient, in all probability, to try out missile defenses. We would create a situation by such an agreement whereby Russia could perfect its missile defense while we could not.

We might find ourselves, within a few years, in a situation where the Russians can tell us "We shall destroy you and we can," and we cannot hit back.

In such a situation our possession of shelters would be of some help. In a dreadful situation, we would, by the existence of shelters, be perhaps a little less desperate, perhaps a little more rational.

I think that we must not conclude a test agreement which amounts to unilateral disarmament and I have not seen yet any suggestion that would not have the feature of such a unilateral disarmament, save one which I might mention later if you want me to.

I would like to say, however, that if we make the mistake to conclude a test agreement I will still tell you gentlemen, for your survival, for hopes, for the best possibility we can give for our resistance, we still have to go ahead with civil defense; perhaps more so than ever.

Mr. FISHER. Now you have said that a test of 1 megaton capacity—

Mr. ICHORD. Kiloton.

Mr. FISHER. One kiloton.

Dr. TELLER. That is what I said.

Mr. FISHER (continuing). Capacity cannot be detected?

Dr. TELLER. I have said this on the following basis: In the summer of 1958, as you well remember, our experts met with the British and Russian experts in Geneva. At that time a network, an observational network was worked out and it was stated, and this statement was signed by all participants, including the Russians, that this network would have no capability to detect tests even in the atmosphere if these tests are less than 1 kiloton.

In the meantime, clean explosives have been developed. The detection, the atmospheric detection of clean explosives is much more difficult.

Furthermore, we are no longer talking about observational posts in Russia but only about observational posts outside Russia. There is no responsible person inside or out of our disarmament agency who claims that tests under a kiloton can be monitored.

It has been claimed that these tests are unimportant. If you believe that tests have the sole purpose, and weapons have the sole purpose to destroy cities, then such a claim can be maintained. But if one remembers that weapons can be used for defense, for instance to shoot down incoming missiles, then these small tests from which we exclude ourselves, but which we may permit the Russians, these small tests will then become all-important.

Mr. FISHER. Would you say, Doctor, that making the tests of this small capacity bombs, that is the 1-kiloton variety, which is what it is—1,000 tons?

Dr. TELLER. Yes, sir. I am very sorry—1 kiloton is 1,000 tons and as nuclear explosives go it is rather small.

When I talked about the shelter withstanding a ground blast I said 1 megaton. That is 1 million tons. And that is a rather big nuclear blast and yet, from a mile's distance, we can withstand it with a relatively inexpensive construction.

Of course what you are talking about now is 100 times less expensive than that and you get much less for it.

Mr. FISHER. Would you say that the use of the 1-kiloton variety tests would be helpful to any nation in developing the atomic bomb or the nuclear explosive capacity?

Dr. TELLER. It certainly would.

Mr. FISHER. In other words, a ban, then, against any kind of atomic or nuclear testing would not—could not be very effective if any of the signatories to any such agreement should unilaterally engage in the smaller type of tests to which you just referred?

Dr. TELLER. This is correct, sir.

Mr. FISHER. Even the smaller tests would contribute to their knowledge and advancement in this field, is that right?

Dr. TELLER. Most certainly.

Mr. FISHER. As much as the larger ones?

Dr. TELLER. Yes, and no. If I had a little money, and if I wanted to learn a lot in the short times, I would be quite interested in using



my facilities in small tests primarily, and then use a very few big tests to verify my results.

In nuclear explosives, as in any other technical undertaking, it makes sense to try something out on a small scale and then go into the big scale.

Mr. FISHER. We hear a great deal about the underground testing and the added difficulty of detecting it.

Would explosions of a higher variety, more than the 1 kiloton underground, be less likely to be monitored than those in the atmosphere?

Dr. TELLER. I would say roughly, very roughly, that underground tests can be hidden even if they are about 10 times as big as a corresponding atmospheric shot.

I would say that if you are careful to avoid detection maybe—and if you use clean varieties—it will be very hard to detect atmospheric tests below 2 kilotons.

It will be very hard to detect in my opinion underground tests that are smaller than kilotons. There is this quantitative differences. Qualitatively there is not much difference.

Incidentally, underground tests can teach us a lot, almost everything we need to know, about the explosive. But they cannot teach us about the effect of the explosive on an incoming missile. In order to develop the defense against missiles there is a lot of reason to make the experiments in the atmosphere, because these are really experiments and not tests. And those who argue against tests say that technical progress should be stopped and imagine that technical progress will be stopped because our world should make the tides recede.

Mr. FISHER. That is all.

Mr. HÉBERT. Mr. Bray?

Mr. BRAY. Dr. Teller, your observations on the atomic tests were not exactly along the line of this study, and it has been brought up and I have been rather interested in that for some time.

I do not want to pursue it far, but I would like to ask you this, do you see any reason why if Russia is sincere, would be sincere in stopping atomic tests that she would not allow adequate inspections and tests?

Dr. TELLER. Sir, I almost would like to beg off.

It is a very difficult question. I don't think that the Russians are sincere. But if you want me to I can give you an argument why the Russians, even if they were sincere, would object to inspection.

They are afraid of foreigners.

Mr. BRAY. Afraid of what?

Dr. TELLER. They are afraid of us, afraid of foreigners. I can understand that an argument of this kind might be sincere. They wish for cessation of nuclear testing is surely not sincere. They have sat with us at the conference table in the—toward the end of 1960 and in the beginning of 1961 during a period where we know that they have been preparing for their next test series.

We know because otherwise they could not have brought off their test series as brilliantly as they did; that they were lying on this very subject.

This we know. I cannot now assume that they are sincere, but at the same time if you want to assume that they are sincere, I can dream up arguments why they should object to inspections.



Mr. BRAY. I remember a few years ago when the promise was made by Russia, Britain and the United States that while negotiations were going on there would be no more atomic tests. During that period Khrushchev said, I believe it was documented 17 times—that he would not go ahead.

Then he went ahead 30 some times during the time that those negotiations were going on. I may have the numbers wrong. But I have always felt that it would be naive to believe a person who was sincere if they did not allow you reasonable opportunities to determine their sincerity.

That is what I—

Dr. TELLER. I am quite sure, sir, that you are completely correct.

Mr. BRAY. Then another matter in regard to Schreiber here—I did want to go a little more into detail, the question of what he testified, you know, here.

As I recall, he was operating on a certain hypothesis and that was that they—that the Russians, if war came, and atomic weapons were used, would aim at our cities and that he would aim and drop the bombs at a high altitude, such an altitude where fallout would not exist.

Now if that was true, the bombs were dropped at such an altitude that the fallout would not exist to any degree, an air raid shelter built only to prevent fallout would be useless.

I think that was his—at least that was part of his theory, when you got down and checked it. And I did question him quite a little. That is where I gathered that that would generally be correct if that were true.

Wouldn't it?

Dr. TELLER. This objectively is true.

Mr. BRAY. And—

Dr. TELLER. If a detonation is performed at a high altitude.

Mr. BRAY. In all fairness to him, I believe it should be clarified. The record would show it, but it has not been printed yet, of course, it was that as we put the silos in deeper and better for our atomic missiles, that any—that the enemy would give up, trying to make a direct hit at ground blast to destroy them, so he then would revert to attacking our cities and drop them at high enough altitude that they would have the fire and the blast, but then at that height it would not have a fallout.

I mentioned to him, as I recall, that in making that assumption you are assuming what the enemy will do. And there is ample military history which is filled with failures of people and countries who failed, who made a wrong guess as to what the enemy was going to do, where, when, and how it would attack.

And I believe most of his rather revolutionary statements were made on the assumption that they would be blasts high enough to give us the blast effect and the heat effect, yet no fallout effect.

And then he made the further assumption that the fallout shelters that we were making were not designed to protect against blast or heat and only against fallout.

I think that is the kind of reasonable explanation of his statement.

Dr. TELLER. This is an excellent explanation and on this basis I can go ahead and answer it a little bit more specifically.

Mr. BRAY. I believe that was—

Dr. TELLER. First of all, I would like to say that I wish I could agree with him, that the Russians have given up an attempt to destroy our hard retaliatory missiles.

We want to make them hard, but to assume, at any time, that you have made them hard enough is a very foolish assumption.

In other words, I agree with you, that we should not imagine we know what they will or can do.

I could argue this for a long time but only on a classified basis. I say that the doubt you expressed is fully justified.

Secondly, I will say that he may indeed detonate explosives above cities causing blast and fire.

I have said that many of our shelters will not be useful under these conditions. Remember, we have not built them. We have merely selected them and want to spend very little money in case there is fallout for which I think there is a probability.

I don't know whether it is 50 percent or 30 or 70, but in beginning to take out insurance, it is not unreasonable to take out the cheapest insurance first, even though this is not complete coverage.

Mr. BRAY. If I had wanted to argue it with Dr. Schreiber any further I would have pointed out the old—of course everyone that has ever had any military experience and training, you are warned never to rely fully on what the enemy would do; you give the enemy possibilities then the smart enemy will never attack in exactly the manner at the time and place in which he expects you are prepared for.

So that very nature would lead me to believe that he might take a different course.

Dr. TELLER. Let me pretend that I don't know what Schreiber's intentions are. If his intentions should be to tell you that the present measures are not sufficient, that you should enact them and then do more, then I will agree with him. But if his counsel is the counsel of despair, this is not sufficient therefore don't do anything, then I will sorely disagree with him.

Mr. BRAY. Dr. Teller, you have made a most, in my opinion, a most interesting, valuable and challenging statement, both as to your direct statement and to your answers to the questions.

Mr. HÉBERT. Mr. Pike?

Mr. PIKE. Thank you, Mr. Chairman.

I would like to join with the gentleman from Indiana in thanking you.

I think your statement has been not only articulate but eloquent.

Doctor, we have had your statement today to the effect that the ground burst is the most dangerous form of an attack. Yesterday we were told that the optimum altitude for the explosion of a nuclear weapon was 17 miles up.

Would you care to comment on that?

Dr. TELLER. It is wrong for Mr. Schreiber or for me to oversimplify the situation by saying "This or that is the most dangerous."

**I do not know which type of thrust of a saber is most dangerous in a duel.** It depends on the type of engagement.

I said that the ground burst is most dangerous because I feel that it is hardest to defend against.

It produces quite a bit of shock and fallout in addition. It is true that if you want to maximize fire damage then the high altitude burst



is most dangerous. The optimum altitude then depends on the size of the explosion.

Mr. PIKE. He postulated a 30-megaton bomb.

Dr. TELLER. For 30 megatons the 17 miles may be a reasonable figure. I believe that under those conditions the shock would not be particularly strong. It would be under those conditions sufficient to construct really fireproof structures and this would be easier and cheaper.

I would not recommend it because as Representative Bray said, we cannot guess the enemy's intentions. We cannot keep secret our measures of defense on civil defense in which the whole country has to participate. We have to be prepared for everything.

We have to be prepared with a defense against fallout, against fire, and against shock. And I claim that a complete defense is possible.

Mr. PIKE. As the megatonnage of bombs available increases, does not the risk of damage from fire increase at a greater rate than the risk of damage from fallout?

Dr. TELLER. It is true. Well, it is partially true.

The shock damage increases less rapidly than other causes for damage, as the megatonnage increases.

The fallout area increases proportionally to the size of the explosion, provided the explosion is on the ground.

On the other hand, active defense, missile defense, can probably keep the enemy's missiles off the ground in all cities which are defended. But it cannot keep the missiles off the ground outside the cities which are not defended locations.

Therefore, with increasing megatonnage, fallout danger can indeed increase and more rapidly than shock.

Now, as to fire, the fire danger, if I have to say something simple and not quite correct, but I think sufficiently correct, increases essentially proportionally to the size of the explosion just as fallout.

It is a type of attack against which missile defense probably will be helpless.

It is also an attack that the enemy cannot wage under any condition. In rainy weather it won't work, for instance. The cloud cover, itself, reduces radiation and the rain will put out the fire.

The fallout may be a more reliable means of destruction, if in such horrible discussions we must talk about reliability.

And therefore, fallout might be the instrument that the Russians may choose. Mr. Schreiber knows too much when he predicts how the Russians will attack. He correctly criticizes the insufficiency of our present program, but by focusing on one point I think he has overstated his case.

Mr. PIKE. I think that there is a fairly substantial area of agreement between you and Mr. Schreiber.

Dr. TELLER. I am sure of it.

Mr. PIKE (continuing). Regarding the fire danger.

Dr. TELLER. Of course.

Mr. PIKE. And I would like to ask you this:

Is there anything so incompatible in the development of structures to be used as shelters which would make it not worth our while to proceed with a fallout program because the money would be wasted if we later went into a fire shelter program?



Dr. TELLER. I don't see any incompatibility. We are spending something like 1 percent as much money on the fallout as we will later have to spend on a more complete program. I believe that you have put your finger on a very important point.

The technical disagreements between us technical people are small. Where we disagree are in political matters on which you should not listen to Mr. Schreiber, and you should not listen to Mr. Teller. You should use your own judgment and I apologize for the impassioned speech which I gave.

Mr. PIKE. Don't apologize for it; it has been very impressive.

We have been told that the worst kind of fire shelter is the one which is in the building or down in the basement of a building. I want to read this one section of Mr. Schreiber's testimony and I would like you to comment on that:

In most cases of groundbursts there is an area subject to fallout alone in which shelter is necessary for survival of that portion of the population which does not move out. However, there is another area consisting of a doughnut-shaped ring around ground zero in which fallout shelters would cause many unnecessary deaths. This is the area in which many small fires would be started by the heat of the bomb, eventually resulting in the entire area being burnt over. Experience in World War II in both atomic and conventional attack shows that persons who remain in shelters in buildings in areas to be burnt over do not survive.

He actually told this committee that the construction of these fallout shelters was going to cost people lives.

Would you comment on that?

Dr. TELLER. War is a dangerous business. I think there are cases where a person might have a better chance if he did not go into a certain type of shelter.

I am sure that it is true that in the kind of flimsy building in which most of us live—I have a nice house in California—I would not put a shelter into its basement. If I built a shelter for myself, which we have considered, I would put it next to the building, because if the building burns, even if I make the shelter fireproof, which I can, the building will collapse on it, there will be these hot, smoldering ashes lying there for a long time and will make it very difficult to get out, provided I am talking about a shelter built for one family where there is not much that the small group of people can do.

If I put the shelter a few yards away I have a much better chance. That all people die in the burnt-over area is simply not true. That there can be additional danger in a firetrap is true. Shelters should be generally constructed for many people in such a way that there should be points of escape which are not likely to be covered by hot stuff.

At any rate the presence of many people who can cooperate, who can stay down there for a time, with stocking of the shelter, and with air, partly reserve air which can be had for a few dollars per person, or at least with an air inlet that during the fire storm can be closed off and then opened, these measures when carefully considered will make survival in a fire entirely possible.

Mr. PIKE. Well, Doctor, I think this is—Mr. Chairman, I don't like to go on too long here.

Mr. HÉBERT. That is all right.

Mr. PIKE. But I think this is a rather important thing. The bill with which we are dealing involves exclusively the construction of shelters in buildings.

Would it be your position that we would be better off to discard this concept and embark upon a program of construction of shelters adjacent to or near or outside of buildings?

Dr. TELLER. From the point of view of fire damage shelters outside the buildings are generally safer.

When you talk about a skyscraper with a big basement, maybe two stories underground, which is constructed in a good and thoroughly fireproof way, with three exits on three different streets, I would rather believe that this is satisfactory.

I think that a statement, in building, outside the building, does not go into sufficient detail. I further would advise you to ask someone who has studied these questions more than I have. It is a difficult question.

As I understand the bill that you are considering, at least in part it concerns shelters, shelter areas which need no construction, which already exist, which need only food supply so that you can stay there if the conditions are right.

I think that this is something like an expenditure of \$1 or \$2 dollars per sheltered person and the chances that these will be useful in case of war are good enough so that I am in favor of this as an interim measure; but only as an interim measure.

Mr. PIKE. You have answered that line very nicely. I want to go on one other line briefly.

This has to do with the testing aspect.

You have indicated, I think, that we could detect a blast of the magnitude of 2 kilotons in the atmosphere or 20 kilotons underground, is that a fair statement?

Dr. TELLER. I said this and I tried to be on the conservative side, in the sense that I tried to bend over backward.

I think that it is entirely possible to cheat even above this limit, but I think it is fairly certain that below this limit one can cheat.

Mr. PIKE. Let me take an arbitrary figure then and say 4 kilotons in the atmosphere and 40 kilotons in the ground.

Dr. TELLER. Possibly, right.

Mr. PIKE. It could be identified?

Dr. TELLER. Right.

Mr. PIKE. Would you be in favor of a cessation of tests above that kilotonnage?

Dr. TELLER. There has been—there have been suggestions along such lines which at the time I have supported. I think that to make such an agreement and try very hard to observe it would have some advantages. I can also see some disadvantages. I can see, for instance, how agreement of this kind could cause further friction between us and the French. I could see how such agreement might lead to a disintegration of our NATO alliance.

On the other hand, I could see that such agreement might cause difficulties between the Russians and the Chinese. We are getting rather deeply into matters which I think are not of really great importance in stopping the arms race, but which have other complicated consequences.



Since this question has come up several times I would like to mention to you a simple suggestion that could be more easily enforced and might be more sensible.

We could agree that we shall not put in any one year more than 1,000 kilotons, 1 megaton's worth of fission into the atmosphere, with no limit on the amount of fusion, which essentially does not cause fallout.

I choose this figure because it is approximately one-third the amount that disappears from the atmosphere each year due to natural decay of activities from past tests. If we stuck to that figure, if we got the statement from the Russians that they will stick to it, we could easily check this and with some testing of other nations, we still could say to the world that the present low and unimportant fallout level is not going to increase.

Mr. PIKE. Thank you very much.

Mr. HÉBERT. Mr. Becker?

Mr. BECKER. Mr. Chairman.

Dr. Teller, many years ago when you were before this committee you impressed me at that time beyond imagination as to your great scientific knowledge and the accomplishments in the field we are discussing.

Then again this morning at breakfast I can assure you I was further impressed and gained a great deal of knowledge in the particular field we are discussing now and have been discussing a good part of this time. Of course we did cover a lot of it at breakfast.

I would like to get now right to the bill we are discussing and you talked on in your statement.

The question of the fallout shelters provided in this program as well as your statements in relation to warning systems and civil defense.

I think this is now what we have got to decide.

Do we proceed, Doctor, to build these fallout shelters or to proceed with this type of program to authorize \$175 million to start, and which you have estimated will run up to—we have estimated anywhere from \$4½ to \$9 billion; or do we first initiate a proper civil defense program where our people must participate, where they must be alerted to the necessity of participating and carrying out their function both from the Federal, the State, the local governments and then to the individual?

This has concerned me for a great many years.

I don't want to belabor the question but I wrote the civil defense laws of New York State in 1950 and 1951; 1950 before the breakout of war in Korea. Then I was able to strengthen them greatly in 1961 which I was unable to do in 1950. How are we going to bring about an alertness upon the people of this great necessity to save themselves and to bring about an area of survival before we start building these fallout shelters that right now it seems throughout the country people are disinterested in?

I know this is a question that is somewhat out of your field but knowing that you have ideas on the subject would you express them, please?

Dr. TELLER. It is out of my field; it is close to my heart, though.

Mr. BECKER. Close to your heart, that I know.



Dr. TELLER. If you are willing to accept my layman's judgment on it, I would approve the present modest request for the reasons I have mentioned.

I would urge that further money be spent almost immediately on better distribution of agricultural surpluses, thereby transforming them from a political liability into a real civil defense asset.

I then would appropriate more money and not very much money specifically for the study of this very important issue and let big expenditures which must follow depend on the outcome of these studies.

Mr. BECKER. Doctor, I have always, as I say, generally accepted your scientific pronouncements in the past and your judgment on this is well taken, but I must pursue this a little bit further. That if we are to make these expenditures, the question comes up that we have been studying, that we have appropriated money throughout the years for this civil defense question, for the question of alerting the country and all we have had so far is a lot of pamphlets, distribution of certain pamphlets. But the question of educating the people to the necessity of what I am concerned with and this we seem not—we seem not to be doing.

Dr. TELLER. Sir, you are raising the question of leadership?

Mr. BECKER. That is exactly right.

Dr. TELLER. It is one of the most difficult questions.

A single person like Nelson Rockefeller can do a lot and has done a lot. A number of my good friends are meeting this summer, scientists, are meeting this summer in Woods Hole for a discussion, I believe sponsored by or at least connected with the Academy of Science. I hope something will come out of that. But the real solution of the problem is something toward which we have to work and if I would know how to give better advice I certainly would give it.

I don't know.

Mr. BECKER. Well, this is what we are confronted with, Doctor, which I have been confronted with for years because I have been concerned with civil defense.

I have always taken the attitude that we can build all the national defense we want, all the great military forces and missiles but if we do not have in conjunction with it an adequate strong civil defense program, we are lost, or we can be lost. And this is what concerns me.

Dr. TELLER. I would like to add to this and I am a little sorry that I have not said this earlier, because it is a strong point.

I would add to this that as a rich country, these agricultural surpluses, with industrial surpluses where we junk apiece of machinery as soon as we think of something better, we could build up a stockpile easy.

With the 5 million unemployed we could easily afford the unskilled labor that has to be put into the construction of these structures that someday may save our lives. We can do it. We are dreadfully lacking in one commodity, the one you mentioned, leadership.

Mr. BECKER. But Doctor, we get to another point now and I am not going to take too long, Mr. Chairman.

We come to the point as legislators, Doctor, for the 180 million people in this country. We come to the point of spending money. We are spending over fifty-odd-billion dollars just on national defense alone. We come to other programs of spending, to the point where we are running great deficits in our Nation each year and greater deficits are proposed.

Now even though we are a rich nation, Doctor, we have many problems in this field of spending money. Certainly we have got to get to a point of deciding, I think some time and some time soon, what it is we want. Do we want all these great, fine things and at the same time sacrifice the area of survival we are talking about here? Or do we want to talk about the area of survival and make a sacrifice against all these other fine things for which we are running great deficits? We have got to make a decision because our people are terribly concerned about this.

Dr. TELLER. Sir, I am not in the position, properly, to compare various areas. I am, as you know, very deeply interested—

Mr. BECKER. Yes.

Dr. TELLER (continuing). In the development of nuclear explosives.

Mr. BECKER. I know.

Dr. TELLER. In nuclear testing. I feel that we must continue with this, if we are to survive as a nation and if freedom is to survive, but I will say this, because I can say nothing that is stronger. I would oppose transferring money from nuclear testing to any other project excepting one, and that is civil defense.

Dr. TELLER. Civil defense is the only project which is in so bad need of funds that if nuclear development should be cut in favor of that, I think we would have made a net gain.

I think there are many other things that we could cut much more easily, but I can make no stronger point than talking about the subject in which I am most vitally interested.

Mr. BECKER. Well, I am very much in agreement with you, Doctor, but as a Congressman, I say again, representing the people, we have a responsibility in the area in which you speak, with which I am in accord, but I think also we have a decision to make, which is what we are going to put first? What is the most important to put first? I am inclined to agree with what you say is the most important to put first.

There are some other things we have to forgo temporarily. I think you as a family man—now this is a judgment as a family man—must agree that there are certain other things we must forgo to do the necessity of the moment.

Dr. TELLER. Sir, I have completely agreed.

Mr. BECKER. Thank you; that is all, Mr. Chairman.

Mr. HÉBERT. Thank you.

Mr. Kelleher?

Mr. KELLEHER. Just two questions, Mr. Chairman.

Doctor, the figure \$20 billion comes to my mind as your estimated cost of your program. Is that substantially correct?

Dr. TELLER. That is a figure that makes sense. But I would not stick to it.

I talked about \$200 per person. It would seem that this would shelter a strong way something like 100 million people. There will



be additional expenditures on stockpiling and other things. On the other hand, one might find in many places less expensive ways to get satisfactory shelters.

I do not believe that I am in a position to do better than give an order of magnitude.

I would rather say that after proper preparation which should spend something like 10 percent of our defense budget, \$5 billion per year.

Then in the course of a few years we are going to have a satisfactory civil defense.

Mr. KELLEHER. Thank you, sir.

Dr. TELLER. I furthermore would hope that we will find ways to do this by inducing other people to help to the maximum possible extent.

Mr. KELLEHER. Would you clear up one matter of confusion for me?

I understood you to say that it would not be difficult to hide or cheat on a 5-kiloton explosion underground?

Dr. TELLER. That is right.

Mr. KELLEHER. Now, in Project Gnome as I recall, you did explode a 5-kiloton device in a deep bed of salt and it was picked up as I understand it in Finland and Japan. Was it because you were not trying to cheat in that?

Dr. TELLER. We not only did not try to cheat, we announced it to the whole world.

Mr. KELLEHER. I see.

Dr. TELLER. To begin with, salt is the worst material in which to hide things. Sand is much better.

Mr. KELLEHER. I see.

Dr. TELLER. A cavity is even better. Furthermore, to detect such an explosion and to identify it as a nuclear explosion rather than an earthquake, these are two very different proposals. There are many earthquakes each year with which these nuclear events can be confused and that is the reason, that is one of the main reasons why hiding of nuclear explosions is possible.

Mr. KELLEHER. Thank you very much, sir.

Mr. HÉBERT. Mr. Chamberlain.

Mr. CHAMBERLAIN. Thank you, Mr. Chairman.

Dr. Teller, I want to join my colleagues of the committee here who have thanked you for your appearance the word I believe it was that Mr. Pike used, was eloquent, and I certainly share that. I enjoyed your comments at breakfast this morning and I am sorry that I had to miss a few of your statements this afternoon as I have gone to answer the quorum call.

With your indulgence, Mr. Chairman, I would first like to ask Dr. Teller a question with respect to missile defense, so it is a bit afield from the subject matter that we are primarily discussing, and that is this, Dr. Teller:

From your broad experience here, is there anything that we could do that we are not doing that would hasten the accomplishment of an adequate missile defense?

Dr. TELLER. This depends on my understanding of the pronoun "we."



Mr. CHAMBERLAIN. Well, we, the Armed Services Committee, to support research, provide funds, do anything else? Is there anything that the scientific community could be doing that they are not doing? Take it any way you want, answer it from all angles. Is there anything that can be done to give us an antimissile missile any sooner?

Dr. TELLER. There can—a lot can be done.

Mr. CHAMBERLAIN. Give it.

Dr. TELLER. Our scientific community is working on many important things and is generally neglecting work on defense. There are many honorable exceptions. Encouragement toward this aim is badly needed.

Even so, a short time ago Representative Becker asked me a very simple question about——

Mr. CHAMBERLAIN. I am sorry I was absent.

Dr. TELLER (continuing). About civil defense, about a different subject, and we wound up, I think he said it rather than I, with what we need is leadership.

In this field again, we need leadership. I realize that specific suggestions can be helpful. I have recently made such a suggestion and you might agree with it and it might help. We might interest our European colleagues in joining us in the missile defense effort. They have not. It seems to me that they could contribute a lot of brain-power and, in addition, a joint enterprise might give us a better feeling for the justification and the eventual success of an undertaking of this kind.

In a very serious sense, I cannot answer your question. We need leadership and from where it will come I do not know.

Mr. CHAMBERLAIN. Very candidly, has Congress done its part? Is there something that we should be doing that we haven't in your judgment?

Dr. TELLER. I fear that all of us are at fault and I dare not say that Congress hasn't done its part because the scientific community certainly hasn't.

Mr. CHAMBERLAIN. Is there anything specific that you feel that we should do that you would like to recommend?

Dr. TELLER. I feel very uncomfortable by your question because I feel like I am missing a splendid opportunity.

Mr. BECKER. Would the gentleman yield at this point?

Mr. CHAMBERLAIN. Yes.

Mr. BECKER. In answer to my questioning here, Mr. Chamberlain, I would say that Congress has for years attempted to provide considerable funds in this field for the scientific community through the DOD. So I don't know what more leadership we can provide than to try to provide the authorization and the funds.

From this standpoint here, that is. In the Nike-Zeus and now the Nike-X and proceeding into the antimissile missile field, I think Dr. Teller's statement from my point of view is an excellent one that we need more leadership, particularly in this field from the scientific community.

Mr. CHAMBERLAIN. This is what I am getting at, Mr. Becker; maybe we have provided funds but we just can't take gold bricks from Fort Knox and buy antimissile missiles.

Dr. TELLER. That is right.

Mr. CHAMBERLAIN. They are not for sale. Is there something we should be doing further on followup?

Dr. TELLER. The funds are not for buying something that is not yet available. The funds are for more research.

Mr. BECKER. That is right.

Dr. TELLER. I am looking for ways how to attract more brains into this business and I am suggesting, among other things, that if, for instance, we could induce our European colleagues, for instance, the French scientists, not to go over the same ground that we have covered years ago, but to join us in working at the forefront of nuclear defense, all of us might be better off. This, however, runs again into a number of very difficult political questions.

Mr. CHAMBERLAIN. Changing the subject just briefly, Dr. Teller, we have discussed here perhaps in my absence maybe more thoroughly I don't know, but we have mentioned clean bombs.

Dr. TELLER. Right.

Mr. CHAMBERLAIN. Could you for the benefit of the committee here tell us what we have done to clean up bombs, what the situation is now and provide us with any information you may have about the efforts of the Soviets in this respect, if there are any?

Dr. TELLER. Sir, I cannot, but this is one field where you can help. We have antiquated laws on secrets. I am not allowed to mention in this room now something that the American people should know about clean bombs, things that the Soviets know. I can tell you that we are cleaning up our explosives at a great rate. To what extent the Soviets have made progress in this field I am most specifically told not to mention.

Mr. CHAMBERLAIN. But you do have information in that respect then?

Dr. TELLER. I am not sure that I am allowed to discuss that.

Mr. CHAMBERLAIN. I am not asking you to—

Dr. TELLER. Let me tell you, the question of what is classified and what isn't is a big science. If I would keep up to date as to what I am allowed to say and what I am not, I wouldn't do anything else, and so whenever I come close to a classified topic, I have to back off.

Mr. CHAMBERLAIN. Well, I—

Dr. TELLER. All I can say is we have made lots of progress. We have created a situation where we can use nuclear explosives in war, and even more importantly for peaceful purposes, so that fallout will not bother us. This much I know I can say because I have said it in the past and nobody jumped on me.

Mr. CHAMBERLAIN. Dr. Teller, one other thing that is disturbing me as we talk of fallout shelters and protection from fallout and from fire storms and such as that, is the problem of ventilating our shelter areas. Now, we have had before our committee professional engineers here who have said that they feel that they can cope with this problem.

Have you given any thought to the problems of ventilation in these shelter areas and what would you have to tell the committee with respect to this most serious problem?

Dr. TELLER. I can tell you a little about it, but again there are much better experts. The problem for individual shelters is not quite easy. For mass shelters it is relatively easier.



The point is this: Generally a shelter can be, if properly constructed, closed off from outside air for several hours. The dangers of fallout and fire storm may have subsided by that time. In most cases I think it will have.

It is, however, better to have an independent air supply for a longer period. One can have such an air supply by putting in some lime to absorb the carbon dioxide which we exhale and put in some oxygen tanks. To provide enough to make sure of survival for 2 days will not add much to the cost of the shelter. This can be done in mass shelters for \$5 or \$10 per person.

A lot more can be done and expenses can be cut by proper filtering devices. If you want a complete discussion I have to give up, but I know that the problem is soluble and I know that it is completely soluble at a relatively modest cost, so that if one has to be cut off from the outside for 2 full days you can protect yourself against loss of oxygen in a fire storm, against fallout, or against a chemical or bacteriological attack.

Mr. CHAMBERLAIN. I am encouraged by your reply.

Turning to your comments about the larger shelters rather than the individual shelters, I would like to say that I have been a bit surprised to have this statement; that over the years here we have had booklets provided here to tell how to build home shelters, perhaps advising of it. I would like to have your comments a little more on this whole shelter.

Have we kind of misguided the populace here into a false sense of security with an emphasis on the home shelter? Are they any good at all?

Dr. TELLER. They are some good, but on the whole if you want to have adequate protection, protection against fire, blast, and fallout, then an individual shelter will become very expensive. If you want adequate shelter against everything, you will have to spend for a family shelter several thousand dollars and this is not something I can advocate for the whole population. This is why I would rather advocate the mass shelters.

Mr. CHAMBERLAIN. A program along the line that we are considering here.

Finally, I would like to go to another aspect of this problem; that is one of selling this to the American people. When the Berlin crisis was at its peak and our tanks were facing the tanks at Fredrikstrasse, the country was pretty alarmed and likewise when our blockade was imposed near Cuba, the American public again were pretty much thinking in terms of what would happen if we became involved in a total exchange.

At those times they were ready to go. I have likened it in the past to the hole in the roof, that when it is raining you can't fix it, and when the sun is shining there is no need.

Now, if we are going to have a successful program, the American people have got to be behind it or giving it support. Now, if we go to the American people and tell them, we are going to be accused of being alarmists, of stirring them up unnecessarily. Now, for example, back in my area I had a little questionnaire that we sent out to the citizens in Lansing, Mich., and that area, and 65 percent of the people indicated that they were opposed to any considerations



along this line and only 17 percent of those that responded said that they felt there was merit to it.

What would your recommendations be and would our citizens could have been here today, Dr. Teller, and heard what you have had to say, I don't think we would have a problem. If the citizens of the country could hear your testimony. What can we do to make the American people more aware of this danger so that they will support adequately a program such as this?

Dr. TELLER. I am delighted to hear these words from you after having heard almost the same words from your colleague to your right.

Mr. HÉBERT. He covered it.

Mr. CHAMBERLAIN. That is right. I am sure—I assure you we haven't compared notes here.

Dr. TELLER. No; but in the meantime I have had a little time to think, at least subconsciously.

I would like to say this: I remember the days in the late 1930's when there was very serious danger of a Second World War, of a most horrible and permanent conquest by Hitler, and I remember that in those days there was an organization which called itself—in Princeton—which called itself the Veterans of Future Wars.

They tried to do whatever they could to stop our preparedness; by trying to act along the pacifist line, they brought the war along. We are witnessing the same phenomenon today.

I may add that I know that most of these misguided people, when the chips were down, did splendidly. Unfortunately, in the rapidly developing technological age, we have less opportunity to change our minds and we are in greater need of foresight.

You have mentioned some problems which go to the root of the question whether democracy can survive.

Gentlemen, I will say that this is your problem. I will not say that it is not my problem. I will admit, however, that I have not proceeded far along the road how to solve this problem.

My little contribution is to come to Washington and do whatever else I can from case to case when I have a chance.

Mr. CHAMBERLAIN. Thank you very much. You are to be commended, Dr. Teller.

Mr. HÉBERT. Mr. Ichord?

Mr. ICHORD. Thank you, Mr. Chairman.

Doctor, I, too, want to join with my colleagues to thank you for your very interesting and highly valued testimony today.

We have had, Doctor, numerous people in the last few weeks who have come before the committee giving moral and philosophical arguments against the shelter program. I might say that although I respect their arguments I reject them almost in toto. I think there is a possibility of a nuclear war and in view of the fact that such a possibility does exist, I want an effective civil defense program, but the testimony of Dr. Schreiber has cast doubts in my mind as to the effectiveness of this program as recommended by the administration. I want the counsel to correct me. As I understand the bill before the committee, it calls for the expenditure of \$175 million during fiscal year 1964 for the installation of shelters and those are fallout shelters, not blast or fire shelters; they would not be fireproof shelters, which would build 10 million shelters with \$175 million.

It would be done on a matching-fund basis with the Federal Government contributing \$2.50 per square foot and the estimated cost is about \$4 per square foot and on a 10-foot shelter space area that would be \$25 being contributed by the Federal Government and \$40, the overall cost, \$15 by the private or governmental nonprofit association.

Now, Mr. Kelleher, in his paper, I believe, envisioned this as the first step in a program which would give this Nation, over a 5-year period, 240 million fallout shelter spaces, although Mr. Pittman, in his testimony, stated that this was not an irreversible step, that it would be delaying the decision, we would just be having 10 million more fallout shelters for the 1964 fiscal year.

Now, Dr. Schreiber set up the example of a 30-megaton explosion at an altitude of 17 miles which would give a fire area with a radius of approximately 40 miles and then about another 15 or 16 miles where there would be danger if you stayed inside. During the questioning of Congressman Pike you indicated that that might be a proper example in the case of a 30-megaton explosion and for that reason, I am beginning to highly question whether this is the type of shelter program we want to go into.

I would like for you to elaborate. And you have indicated that by giving testimony before the committee about a blast and fire shelter which would cost \$200 per person. I would like for you to elaborate on that.

Dr. TELLER. I would have no question whatsoever about providing funds for stocking shelters that already exist.

Mr. ICHORD. Well, now, what about—

Dr. TELLER. This is—I understand.

This is an exceedingly cheap program for the purpose. If you talk about shelters which have to be specifically constructed, then I would insist on these shelters being low-cost shelters and outside the regions where fire hazard is particularly great.

I believe that along these lines a very reasonable compromise can be worked out.

Mr. ICHORD. Let me understand you there, Doctor.

You feel that we should make these shelters fireproof, these 10 million shelters that the administration contemplates?

Dr. TELLER. I am not trying to argue now in precisely what order we should proceed. If the Administration sees its way to advocate today the fallout shelters, I would go along with it. But I would try to limit the money on fallout shelters to cheap shelters and to shelters located in areas where the fire danger is relatively small. That is, relatively far from immediate target areas, where fallout is a danger and fire is a much lesser danger.

Furthermore, I would favor shelters of this kind in the areas of the country which are not particularly dry. The fire danger in California is much greater than in Louisiana.

Mr. ICHORD. Now, the shelter which you testified would cost \$200 per person, how many of those shelters would you feel that the Nation would need to have an effective shelter program against blast and fire?

Dr. TELLER. I do not know.



Such shelters will be needed everywhere, where we are close to target areas. The particular plan that I talked about works for certain types of soil. Where there is limestone, excavation of different types might be preferable. Where there is high water level, again different things might have to be done. When we discuss an especially important question, like that of New York or Los Angeles, existing subway systems or subsequent subway systems to be constructed might be very important exponents to exploit.

In the end I think by one way or the other we probably have to supply in the course of the years something like 100 million shelter spaces which may cost more or may cost less on the average than the \$200 per person.

I hope that with more ingenuity and more exploitation of multiple-purpose shelters, we might get the figure under my \$200 figure today, that exists today. But I think that the total shelter cost in the course of the years will have to amount to the figure which has been mentioned here before by your counsel, I believe, something like \$20 billion.

Mr. ICHORD. Seventy?

Mr. KELLEHER. Twenty.

Mr. ICHORD. Twenty.

Dr. TELLER. 20 billion.

I am talking about an expenditure of something like 10 percent of our cost of defense for civil defense, to proceed with this at a measured rate.

I believe that fallout shelters solve one sort of problem and the cheapest sort. The remarks, the objective remarks of Dr. Schreiber must be kept in mind and I think that it would be wise to direct fallout shelter constructions into those areas which are more in danger by fallout and less by fire.

We are facing a difficult problem and the one point with which I am taking issue in Dr. Schreiber's remarks is the understanding which he may not have meant, that because this is not complete protection, because it might be misapplied, it should be disregarded.

Mr. ICHORD. Now, the 5-year program which has been put before the committee would give us how many of these shelter programs, Mr. Counsel, 90?

Mr. KELLEHER. 95 million.

Mr. ICHORD. 95 million under this organization—

Dr. TELLER. 95 million shelter spaces?

Mr. ICHORD. 95 million shelter spaces, fallout shelter spaces.

Do you feel that this Nation would need that many?

Dr. TELLER. I don't know. I believe that at the right spots, places which are not particularly endangered by firestorm, these fallout shelters might be needed. Perhaps the right figure is not 95 million, but 50 million or less.

I would say that I would rather have 95 million fallout shelters than 50 million fallout shelters and nothing else. But after having constructed the proper number, that might be 30 million, for instance, we might then decide that the remaining places which are more in danger by fire or blast, might deserve different and more expensive construction.

Mr. ICHORD. Thank you, Mr. Chairman.

Mr. HÉBERT. Mr. Pirnie.



Mr. PIRNIE. Thank you, Mr. Chairman.

I have been very interested to note that you view this project in the light of overall defense and security responsibilities. You place it in perspective there, Doctor, as I see it. We have listened to a great deal of testimony as to the impact of this program on our people, the psychology of the young and the psychology of the people in general. I wonder if you would be willing to comment as to whether you feel, as some of us do, that we encourage the will to resist by indicating that we are attempting to safeguard that important part of our national resources, namely our people, and that we are not, shall I say, creating panic or mental disturbance among the young by identifying this project with school buildings and public structures.

What is your thought?

Dr. TELLER. My serious comment on this is that we are encouraging the will to resist, and furthermore, we are discouraging the Russian will to attack.

I could, also, if the chairman will permit me, speak in a slightly lighter vein.

May I, sir?

Mr. HÉBERT. Certainly. The floor is yours. You are on stage; the spotlight is on you, Doctor.

Dr. TELLER. Almost 2 years ago there has been a little piece in the Harvard Crimson, I don't know, you may have seen it, sir.

Mr. BECKER. I have seen it.

Dr. TELLER. The article was—the piece was entitled, “On a Sane Navigation Policy.”

Mr. BECKER. That's right.

Dr. TELLER. I am not quoting you the whole thing—I can't—but it is worth reading, and I will quote you a brief excerpt.

It started by saying, “It has come to our attention that some members of the passengers and crew are advocating the disastrous policy of ‘lifeboats.’ We are unalterably opposed to this disastrous proposition for the following reasons:

“It shows lack of confidence in our captain.

“It deflects our attention from really important projects, like the construction of unsinkable ships.”

I think it has forgotten one argument in the many which I haven't quoted, but which should have been added:

It frightens children.

We have lifeboat drills. We have seat belts. I believe safety does not come from disregarding peril, and the deepest disturbances, psychologically, are not due to the facing of a danger, but to the attempt of trying to forget the danger.

Mr. PIRNIE. In other words, when you face the facts, you find that even children are pretty capable of reacting properly?

Dr. TELLER. I feel that children are on the average as reasonable as adults, when one talks to them properly, as one also should talk properly to adults, and I think that my statement is qualified by the fact, changed by the fact that I have advanced to my 55th year. Perhaps if I would be objective about it, I should have said that children are more reasonable than adults.

Mr. PIRNIE. They probably would be.

But I would assume, Doctor, that you are seeking for this country to be so prepared with respect to its weapons system or its whole defense program so that at any given time in our history we will not only have the will, but the capability to resist or so that we will not be subject to international blackmail and lose through intimidation that for which we have worked so hard and spent so much of our life fortune for, is that right?

Dr. TELLER. This is my opinion.

I think we are much too late in starting our civil defense effort. I think that a lot of thought should go into starting it the right way and in his sense; I highly welcome Dr. Schreiber's statements on the danger of the fire hazard, but only in this sense. And I think that if we now bend our efforts to civil defense, we still can be reasonably safe and in a few years, we can be satisfactorily safe.

Mr. PARNIE. Thank you, Doctor.

One last question. If I understand your testimony correctly, several times you have stated that while you did not consider this a complete answer, you considered it a logical initial step?

Dr. TELLER. That is correct.

Mr. PIRNIE. Is that correct?

Dr. TELLER. Right.

Mr. PIRNIE. Therefore, without qualification you would think that this Nation was proceeding in the right direction if we took such action as this contemplates?

Dr. TELLER. I would, perhaps, in view of some of the other questions, like to recommend in a concrete sense, and perhaps in a mistaken sense, that you approve the administration's proposal for the coming year, but that you take a very critical look at the 5-year plan, because this longer plan probably could be effectively improved before it is put into action.

Mr. PIRNIE. In other words, to check performance against all of the factors that would be involved as the years come?

Dr. TELLER. And face the necessity, the probable necessity, in my mind the certainty, of providing in coming years more protection than merely the fallout protection.

In the meantime, do whatever you can to encourage the expenditure of money in those areas where fallout happens to be the biggest danger.

Mr. PIRNIE. One of the factors that influenced consideration of this approach is the dual purpose which is found in many of the—particularly those in the big skyscraper installations where they could use the underground areas for either working space, storage, or some similar use.

Is there any feasible purpose being suggested for the type of shelter that you had in mind, for fire?

Dr. TELLER. In those cases, in the case of the skyscrapers, I feel that very careful thought should go into the point of making these shelters fireproof. I think this can be done.

I do not know in what way your committee can stimulate that it should be done.

Mr. PIRNIE. Except to bring the subject to the attention of those who might have the responsibility of engineering or designing?

Dr. TELLER. I believe that this should be done and in the case of urban areas, of skyscrapers, I would put great weight on fireproofing.



Mr. PITTMAN. Yes. Do each of you have a copy of the paper on fire?

Mr. HÉBERT. That is what I am checking on now. All members have a copy?

Mr. KELLEHER. Yes; they do.

Mr. HÉBERT. Yes. You may proceed.

Dr. STROPE. Thank you.

#### STATEMENT OF DR. WALLACE E. STROPE, DIRECTOR FOR RESEARCH OFFICE OF CIVIL DEFENSE

Dr. STROPE. Mr. Chairman, gentlemen: Several witnesses before this subcommittee have advanced the thesis that the real civil defense problem is fire following nuclear attack rather than fallout and, indeed, that high-altitude detonations would be a more likely mode of attack against cities and populations in general.

#### DR. SCHREIBER'S TESTIMONY

Dr. Schreiber, of MIT, was particularly positive on this point. He summarized his position in the following way:

As long as their capacity to deliver nuclear weapons by ICBM's remains limited, the Soviets would almost certainly use high-altitude airbursts of large bombs against cities, causing no fallout whatever but blasting and burning vast areas around their targets.

The detonation that Dr. Schreiber predicted in his testimony, which was a 30-megaton explosion at an altitude of 17 miles, would indeed cause no close-in fallout. All of the fallout would eventually be in the form of worldwide fallout. Neither would it produce significant blast effects on the surface below. Its entire capability to harm a city would lie in its supposed fire-producing potential.

#### PURPOSE

It is my purpose to show that the fire threat from the detonation postulated by Dr. Schreiber would be small under ideal conditions and would be negligible under most conditions. It is further desired to set the record straight on the dimensions of the fire threat as seen by the Department of Defense and to discuss the reasons why the use of nuclear weapons primarily for incendiary effects is unlikely.

#### IGNITION THRESHOLD

One of the major factors affecting the fire-making potential of nuclear weapons is the ignition threshold for various combustible materials. This is a major point at which Dr. Schreiber went wrong in his calculations.

Curiously, he selected 12 calories per square centimeter as his criterion on the basis that this energy would cause serious skin burns to people exposed to the heat flash although this fact bears no direct relationship to the question of ignition of fires. He assumed that it did. However, he would get considerable support for his choice of ignition thresholds from the information cited in table 7.44 of the "Effects of Nuclear Weapons" (ENW), the document prepared by the Department of Defense from which Dr. Schreiber took his data.



For example, this table indicates that for a 10-megaton airburst, the ignition threshold for newspaper is about 6 to 8 calories per square centimeter. This is not inconsistent with the 6 and 12 calories per square centimeter used by Dr. Schreiber.

#### NEW DATA

It so happens that at the time the current edition of the "Effects of Nuclear Weapons" was being prepared, in 1961, there existed new experimental data on the ignition thresholds for high-yield weapons obtained by the Naval Radiological Defense Laboratory that indicated that the information in the "Effects of Nuclear Weapons" was much too low. These data were published in unclassified form in 1959 and if Dr. Schreiber had looked for them, he would have found them. They differed so markedly, however, from the older information upon which the ENW was based that it was decided within the Department of Defense not to change the numbers until a new set of measurements could be obtained to corroborate the NRDL data. The new measurements have been completed within the past year by the Naval Materials Laboratory in New York and fully corroborate the NRDL findings.

This committee is aware, I am sure, that the Department of Defense maintains a classified publication called the "Capabilities of Atomic Weapons" as well as the unclassified "Effects of Nuclear Weapons." Both publications are prepared by the Defense Atomic Support Agency, which is the DOD agency concerned with obtaining information on nuclear weapon effects. The new information is so convincing that it is being incorporated into the classified publication and consideration is being given currently to issuing a correction to the "Effects of Nuclear Weapons" prior to its next revision date.

The new information shows that the ignition threshold for newsprint, which is among the most flammable materials likely to be exposed to thermal radiation, is about 34 calories per square centimeter rather than the 6 to 8 calories per square centimeter listed in the current edition of the Effects of Nuclear Weapons. This change, which has been suspected since 1959 and is now confirmed, markedly changes the sort of calculation attempted by Dr. Schreiber.

For example, his 30-megaton weapon detonated at an altitude of 17 miles barely exceeds the new ignition thresholds directly under the weapon and would ignite newspapers, for example, only within a radius of about 5 miles on a very clear day. As I will show shortly, the effects would be negligible under many other conditions.

#### RELATION OF OPTIMUM HEIGHT OF BURST FOR THERMAL RADIATION TO OPTIMUM HEIGHT FOR BLAST

The Defense Atomic Support Agency advises us that the optimum height of burst for thermal radiation has not been an object of study since the fire potential of a nuclear weapon has always been considered a bonus effect and one that is not readily predictable. However, in view of the question raised by Dr. Schreiber, such as analysis has been made by the Defense Atomic Support Agency and shows that the height of burst that maximizes the ignition radius is very nearly the same as the height of burst that maximizes low blast overpressures.

The results have been included, as Secretary Pittman mentioned, in the footnote to the charts on pages 2 and 3 of the yellow booklet provided to the committee. Those numbers then represent the maximum ranges on a clear day for thermal radiation for any condition of burst for the weapons indicated. In fact, as Secretary Pittman noted, it is only for a surface burst that ignitions can be expected in the light damage region. This is because the range of low overpressure is reduced below that of the airburst more than is the ignition radius.

#### EFFECT OF ATMOSPHERE ON TRANSMISSION OF THERMAL EFFECT

Now, another serious problem affecting the reliability of estimates of the incendiary effect of nuclear weapons has to do with the range of action of the thermal effect; that is, how it is degraded and reduced in passing through the atmosphere.

Dr. Schreiber uses the information in the Effects of Nuclear Weapons indiscriminately, even though it is clearly stated in the Effects of Nuclear Weapons that the data and equations used are reliable only within a distance equal to one-half the visibility of the atmosphere. Since the average visibility in metropolitan areas is about 10 miles, this means that all distances quoted over about 5 miles are open to question.

As noted on pages 321 and 362 of the Effects of Nuclear Weapons, the transmission equations overstate the range of thermal radiation effects by an unknown but possibly large factor. I call this fact to the committee's attention because, although the Department of Defense is not prepared to recommend a change at this time, additional research can only result in a further reduction of the current estimates of fire ignition.

#### EFFECTS OF WEATHER AND CLIMATE

I would like to complete the story of the uncertainties confronting the designer of a high-yield, high altitude incendiary weapon system for use in attacking the United States, or any other area, for that matter, by mentioning the problem of weather and climate. Weather and climate enter the nuclear fire problem in several important ways. The transmission of the thermal energy from the burst to the target area is strongly affected by the presence or absence of clouds, their types and locations, by visibility, by surface reflectivity, and by other meteorological factors. The ignitability of the materials in the target area and the possibility of spread of fires after initial ignition are directly influenced by the weather conditions at the time of attack and during a number of weeks preceding attack.

#### EXTENT OF CLOUD COVER

For high-altitude detonations, a critical factor is the amount of cloud cover between the weapon and the target area. Cloud transmission of thermal radiation, assuming 100 percent for a clear day, is about 30 percent for light cloud to about 3 percent for dense cloud, based on solar radiation data.

A detailed analysis of cities of 100,000 population or larger shows us that the average city has but 120 clear days a year and less than 10 percent have as much as 200 days. The average American city



has about 120 days of heavy cloud and over 100 days a year it is raining. Thus, for the average American city, the high-altitude incendiary weapon system would be fully effective one-third of the time, partially effective one-third of the time, and completely ineffective one-third of the time.

No military planner would be satisfied with a weapon system of such low reliability. However, it might be considered that, even so, he might wait, he might try to choose a particularly advantageous day for the attack, but unfortunately the condition when the skies are clear simultaneously over all or nearly all of our major cities is extremely infrequent and hard to predict.

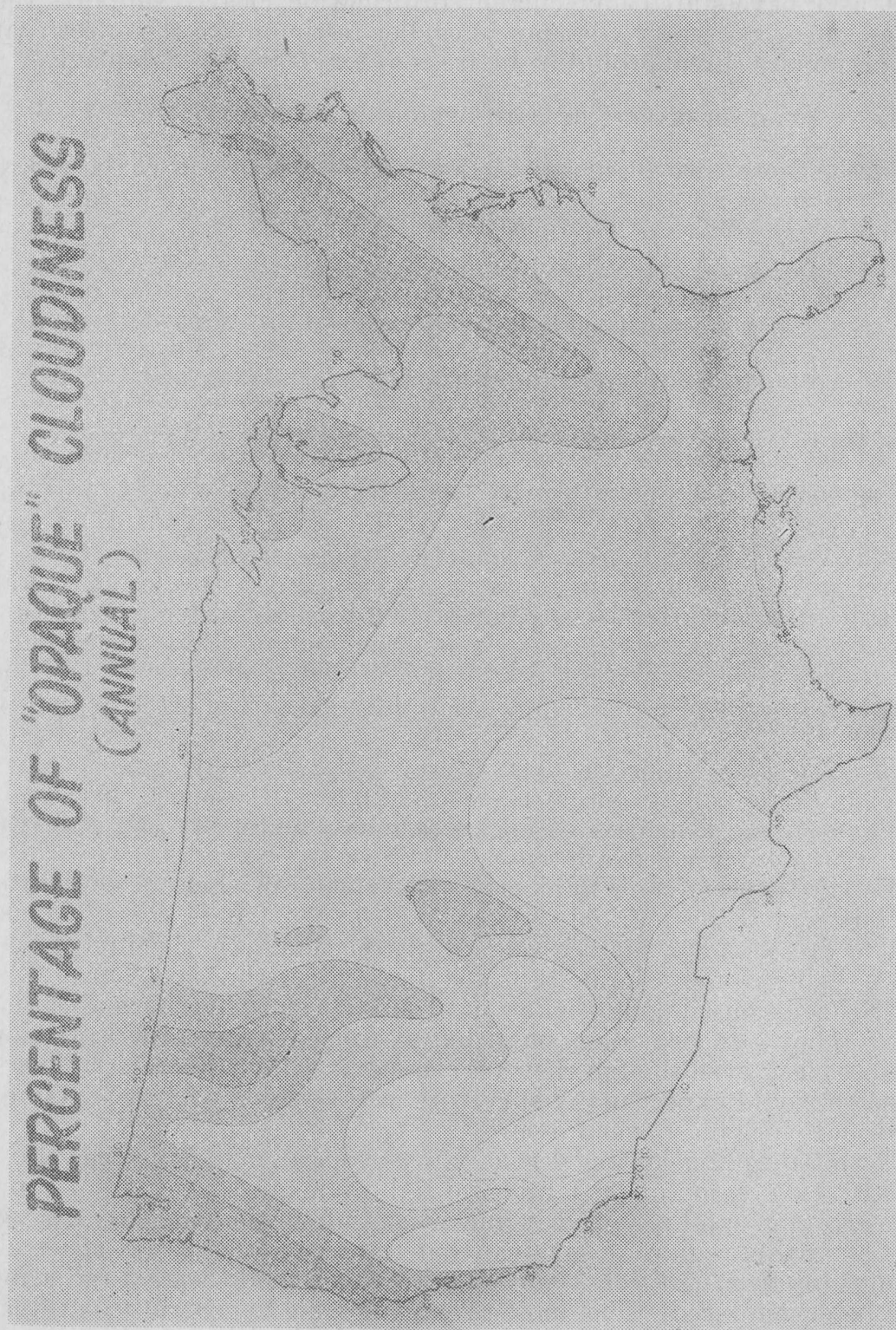
Most of the time some of our cities have clear skies and others have cloudy skies. So the Soviet planner would have to settle for an uncertain chance of starting fires in some fraction of our cities as a result of attacks on all of them.

I happened this morning to pull out of the paper the weather map which is in the paper. I have saved an earlier map for the 27th of June as well.

It is quite interesting in looking at the 27th of June that it is raining in New England, there are heavy clouds in Boston, partly cloudy in Buffalo; New York and Washington are clear, but over in Wisconsin and Minnesota it is raining, it is raining in the South, Tampa, Miami are in the rain area, it is cloudy in Jacksonville, Nashville, Houston, and Galveston, it is raining there; it is raining in Seattle. It is cloudy in Portland; it is clear in Salt Lake City; it is clear in Kansas City. Denver is clear also. In Iowa it is cloudy. Today's map has very similar information spread about the country, but in different locations.

This basic difficulty facing the high-altitude incendiary attack is summarized in the map (enclosed) which shows the percentage of time





that "opaque" cloudiness occurs in various parts of the country. Since industry and population need a reliable source of fresh water, most of our cities are located in regions of high rainfall and, consequently, in areas where cloudy conditions are common.

There is considerable uncertainty about the extent of ignition of fires, as I have stated, but current information clearly supports the statement of Secretary Pittman in earlier testimony to the effect that the major fire threat would be in areas of extensive blast damage.

#### FIRE RESEARCH BY THE OFFICE OF CIVIL DEFENSE

Furthermore, any changes from additional research are expected to result in further reduction of the current estimates. This does not mean that the Office of Civil Defense is not aware of the importance of fire defense. A large part of our research effort is directed toward the development of measures to mitigate fire damage.

At the present time the OCD finances more fire research than any other organization in this country. We believe that this effort gives us the best understanding of the fire threat available today.

#### THE RELATION OF THE SHELTER SYSTEM TO FIRE DEFENSE

The position advanced by the Department of Defense is that an effective system of fallout shelters is an essential element of any reasonable civil defense effort and that there are low-cost ways of achieving this essential protection. In urging this program, it has never been implied that it is a panacea, that it would provide protection in the impact area, or that emphasis on achieving fallout protection left no room for other important functions of civil defense, such as warning, fire defense, rescue, medical aid, monitoring, and communications.

These are also important parts of the civil defense system.

What we do believe is that these functions will be most effective if founded on the firm base of an operational shelter system, and this is particularly true of fire defense.

We can expect large numbers of survivors in shelters—even the shelters now being marked and stocked—in the fringe areas of blast and heat around a surface nuclear detonation. In the first place, these shelters offer complete protection against the flash burns that Dr. Schreiber used as his criterion of effectiveness for thermal radiation. They also provide a small but significant degree of protection against blast, even though they are classed as fallout shelters. Therefore, we would expect many survivors in the region of 1 to 7 pounds per square inch blast overpressure.

For a 5-megaton surface detonation, as you can note from the yellow booklet, this region of moderate and light damage extends from 4 to 9 miles from ground zero and includes most of the damaged area.

It is in this region of survival that the secondary threat of developing fires from ignitions caused both by blast and thermal radiation will be encountered. The most promising time to control this threat is in the first half hour after attack when the ignitions are small and capable of being snuffed out. This is corroborated by historical experience at Hiroshima.



## FIREFIGHTING AT HIROSHIMA

At Hiroshima, very little firefighting was reported inside the larger reinforced concrete buildings that survived the explosion, some at very close range. Most survivors apparently fled to safer locations quickly. However, in at least four instances, people remained on fireguard and effectively prevented extensive fire damage by extinguishing incipient fires.

An outstanding example was Building No. 24 on the records of the U.S. Strategic Bombing Survey, which was located only a quarter mile from ground zero. Here, about a dozen people remained in the building, snuffed out fires, and survived in the heart of the Hiroshima firestorm area. This incident, and others, show more than the obvious point that fireguard actions in snuffing out small fires are really feasible and effective. They also indicate that such action can be effective in a particular building despite fires in other buildings in the same general region.

The existence of a community shelter system is the foundation upon which this type of emergency action can be built. When people are brought together or assigned to community shelters, they become available for organization, for assignment to functions, and for training to do vital tasks. Research is underway to develop the proper basis for these actions.

## METHODS OF FIRE DEFENSE

We are also studying various means of markedly reducing the fire vulnerability of urban areas. These measures, most of which are quite simple, are being considered for incorporation into emergency plans. Also, as Secretary Pittman mentioned in previous testimony, we are exploring and developing active thermal countermeasures—devices that would interfere with the arrival of thermal radiation at the target.

We would expect to concentrate these measures in areas of high fire susceptibility and in regions of high industrial value. An effective system seems to be achievable in the short term with an initiation time of 2 minutes and a sustaining time of 6 hours for about \$200,000 per square mile protected. We expect to reduce costs considerably through further developmental work.

In reacting to Secretary Pittman's statements on this matter, Dr. Schreiber said that a crash research and development program to translate these prospects into reality would be worth more than the fallout shelter program. We see no reason to make a choice here and we intend to pursue both. But it does highlight the fatal flaw in Dr. Schreiber's argument.

RELATION OF SOVIET USE OF THERMAL EFFECT TO EFFECTIVENESS OF  
SHELTER SYSTEM

Thermal radiation is the most fragile effect of a nuclear detonation. Any opaque substance stops it completely. Even modest weather changes make marked changes in its effectiveness. If the Soviets were to commit themselves to the sort of weapon system Dr. Schreiber suggests, the potential effectiveness of civil defense would be sharply



increased. We don't think they are likely to make such a mistake.

Thank you very much, gentlemen.

Mr. HÉBERT. Thank you very much.

Mr. PITTMAN. Let me supplement, if I could, with one comment, Mr. Chairman.

#### FIRE DEFENSE AND THE SHELTER SYSTEM

Dr. Schreiber, in making a statement that a fallout shelter system could actually cost more lives than it saves in a fire environment was assuming that people would move like dumb animals into the designated shelter areas with no leadership or initiative to step outside in the event that the building was on fire or to move out to fight nearby fires.

I just want to assure you that the operating doctrine that goes with the shelter system is more flexible than this. That the instructions put out from civil defense authorities would tell people how to move out and fight fires and to do so with a minimum exposure to radiation. So we anticipate the use of shelters as a base for firefighting, not necessarily locking people in there to be cremated as was supposed in this testimony that we are referring to.

Mr. HÉBERT. I think at this point, Mr. Secretary, if any member of the committee has any question to ask Dr. Strobe, it would be well to proceed.

Mr. COHELAN. Mr. Chairman.

Mr. HÉBERT. Mr. Cohelan.

#### FIRE EFFECTS OF WORLD WAR II BOMBING

Mr. COHELAN. Mr. Pittman, do you have any studies in the department on fire damage and effects of our bombing raids say on Hamburg or Tokyo, and so on?

Mr. PITTMAN. We do, and Dr. Strobe is familiar with them; if you want he can—

Mr. COHELAN. Yes. I think it is relevant at this point.

Dr. STROPE. Yes. The detailed information is in the reports of the strategic bombing survey. These reports initially were classified. They are now unclassified. They indicate that the incident at Hamburg was probably the most severe fire condition that has ever been encountered and yet it is instructive that, although there are still questions about the exact numbers, in this case at least 85 percent of the estimated people within the fire storm region survived. Some of these people left the area, but most of them did not.

Part of them were protected by rather good shelters called bunkers, but most of them were not. Mention was made in the testimony about the fact that survival could be explained because the canals helped them out, but this is simply an acknowledgment of the fact that in every city there are areas of high susceptibility and low susceptibility and that canals and wide streets and parks and so forth do exist and that people have a high survivability under these conditions.

#### SHELTERS AND FIRE

Mr. COHELAN. How about the basement environment in buildings?

Dr. STROPE. In load-bearing brick buildings, particularly those

that were also struck with high explosives and demolished, is where it is believed that a large part of the victims were lost—although there were survivors in these circumstances also. These were obviously the weakest conditions in Hamburg. These were in essentially individual dwellings.

Mr. COHELAN. But the fact of the matter is, there were a lot of people lost in the basement environment as a result of fire and other effects?

Dr. STROPE. That is correct.

Mr. COHELAN. The building falling itself, and all the rest. But now, do you have any quantitative data on those situations? I mean who survived, who didn't?

Mr. PITTMAN. The question is whether we can distinguish between the causes of fatalities. We have fatality figures. I think we have very poor information on the causes.

Mr. COHELAN. Well, as a matter of fact, I have seen a study. I am sorry I didn't bring it this morning. I think it has been done under your auspices, one of our scientists at the University of California has done some work in this field and the reference was made to Hamburg and firestorm and the effect on people who went into basements.

Now, this relates, of course, to our studies now on the value of the fallout shelter and its susceptibility to fire damage even though we could get the protection from radiation.

As I recall the study was interesting in that it did show there were very substantial fatalities even though people were in a protected environment, but I think the significance of the data, as I recall it, was that there were an awful lot of people who did survive as well.

But I do think that this ought to be introduced at this point in the record, if you have any quantitative data.

(Information requested follows:)

#### CASUALTIES AND SURVIVORS IN SHELTERS OF THE HAMBURG AIR ATTACK, JULY 27-28, 1943

This paper summarizes the estimated casualties and survivors in shelters, particularly the basement or celler type, of the Hamburg air attack, July 27-28, 1943. The information for this paper is taken from:

"Death From Fire in Large Scale Air Attack—With Special Reference to the Hamburg Fire Storm," by Kathleen F. Earp, Home Office Report CD/SA 28, Home Office Scientific Advisers' Branch, Whitehall, SW1, April 1953.

"Report by the Police President and Local Air Protection Leader of Hamburg on the Large Scale Raids on Hamburg in July and August 1943, Experiences," volume I: Report, I.O.(T)45, Home Office, Civil Defense Department, Intelligence Branch, January 1946.

The U.S. Strategic Bombing Survey reports (Nos. 40, 44 (vol. 1), 154 and 193) on Hamburg have been referenced in the Earp report. The Stanford Research Institute and Lehigh University "Impact of Air Attack in World War II" reports have not been referenced since they are based on the USSBS reports.

TABLE 1.—*Fire storm casualties as percentages of various populations of Hamburg on July 27-28*

Percent, estimated 40,000 killed to estimated 1,500,000 in city of Hamburg—	2.7
Percent, estimated 40,000 killed to estimated 470,000 in area raided (heavily damaged, 22 square kilometers)-----	8.5
Percent, estimated 40,000 killed to estimated 280,000 in fire storm area (13 square kilometers)-----	14.0



TABLE 2.—*Casualties related to 2 basic shelter types*

Shelter type	Location	Experience
Bunkers and splinterproof surface shelters.	"Many bunkers and splinterproof surface shelters were situated in middle of extensive area fire and firestorm zones" (Police President, p. 88).	No casualties from fire (Police President, p. 88). Estimated population in bunkers and splinterproof surface shelters in firestorm area, 53,000 (Earp, p. 10).
Cellar shelters (private and public).	(a) 101 air raid shelters in cellars under houses damaged or destroyed in central part of city but not in firestorm area. (b) In firestorm area.....	Casualties (93 dead, 6 missing, and 46 injured) only occurred in 8 cases (Police President, p. 87).  "In main firestorm area, however, there was a terrifying difference in the proportion [of casualties]" (Police President, p. 87). Estimated population in private and public cellar shelters in firestorm area: 227,000 (Earp, p. 20) of whom: (1) 40,000 were estimated casualties from blast or fire in shelters or from fire after leaving shelter. (2) 45,000 were rescued. (3) 142,000 survived in cellar shelters or fled to safe areas (Earp, p. 14).

Mr. COHELAN. Now, my other question would be: These are technical matters that we are considering and we have heard Dr. Schreiber's testimony and we are hearing this testimony this morning. What is the range of opinion?

#### RANGE OF OPINION ON FIRE

Is there a spectrum of opinion on this fire question?

What is the range or spectrum on this opinion of fire damage? Mr. Kelleher's report commented on some—on fire storms by various commentators and authorities and so on. What is the range of opinion here?

Mr. PITTMAN. I might undertake to answer generally; Dr. Strobe can supplement me.

Among fire experts and people who have studied the military or wartime fire problem, there are differences, but they are narrow. There is a wide consensus on the fundamentals of this problem which are generally consistent with the views you have heard today.

The problem I think—the appearance of a wide difference of opinion comes from people who are technically qualified in other fields undertaking to apply isolated data to the fire problem.

We had an electrical engineer, who was Dr. Schreiber, talking about the fire problem, and I think Mr. Kelleher's memorandum cited a number of people on the fire problem, none of whom were as close to being technically qualified as Dr. Schreiber.

I think Hanson Baldwin was one. There are not very many experts in the country on wartime fire problems; those that exist have their differences, but they are not wide.

Would that be a fair statement, Dr. Strobe?

Dr. STROBE. Yes; I think so, with one addition: that you must distinguish between the opinions of people who are competent in the field who have actually studied the problem of fire ignitions or fires themselves and those that have not.

Within the people who are actively engaged in this research, the range of opinion is, as Secretary Pittman says, quite narrow, but the data we have presented on ignitions is now the accepted data among these people.

The arguments within this area now are whether it should be lower, not higher. The major area of concern where our uncertainties are greatest—where it allows the greatest amount of discussion and opinion among those that are expert in the field—is in the fire-spread problem.

This is an area which we are giving a great deal of emphasis. Again here, as in most cases, the tendency is to state things in a conservative manner; that is, to look at what it could possibly be and state the maximum level. So that, as I have mentioned, it is generally the case that, as we do obtain better information, it tends to bring the problem into a lower focus than is possible in the uncertain region; but by far the fire-spread problem is the most uncertain aspect today of the fire problem.

#### MILITARY VALUE OF INCENDIARY EFFECT

Mr. COHELAN. Assuming the validity of the information that we have before us, wouldn't this indicate to military planners, potential enemies, that if they are going to use this as a basis for attack, that they would select their targets? In other words, what you have said today is that there would be a greater effect in some areas under certain conditions than there would be in other areas.

Now, what is your response to that?

Dr. STROPE. My response to that would be, and I would be simply reciting the response obtained from our targeting people, that very simply they do not consider the incendiary effects of the weapon in their choice of weapon size or point of delivery. It is considered as a bonus, if it occurs; and it is considered to be highly unpredictable and very likely to be absent in many cases.

Mr. BECKER. Mr. Chairman.

Mr. HÉBERT. Are you finished?

Mr. COHELAN. Yes.

Mr. HÉBERT. Mr. Becker.

#### DEGREE OF SPECULATION ON FIRE

Mr. BECKER. Dr. Strobe, you, in answer to a question a few minutes ago, talked about the competence or lack of competence of people in this fire field and also their study and being concerned with it in the Defense Department as experts in this matter.

Yet in reading your statement—and I have gone through it again—I find that many of your statements are based upon speculation or the eventualities under certain conditions, a matter of speculation. Is this correct?

Dr. STROPE. I do not believe it is correct; no.

Mr. BECKER. Well, on page 5, for example, here in this whole long paragraph you say "Another serious problem," and you deal with Dr. Schreiber's using the information in the "Effects of Nuclear Weapons" indiscriminately.

You go on further and say:



As noted on pages 321 and 362 of the "Effects of Nuclear Weapons," the transmission equations overstate the range of thermal radiation effects by an unknown but possibly large factor.

They overstate it. You don't say how and the unknown factor is not qualified. Then you go on:

I call this fact to the committee's attention because, although the Department of Defense is not prepared to recommend a change at this time, additional research can only result in a further reduction of the current estimates of fire ignition.

In other places here there seems to be so much either imagination or I will say much left to speculation as to what might happen under certain conditions. It seems to me that there is not too much of a definitive nature about this in order to apply the matter of competence on whether it is Dr. Schreiber's part and I am not going to defend his arguments, but there seems to be so much lacking in actual facts to determine whether one is absolutely correct or whether the other is correct. It is not definitive so far as I can see it.

Dr. STROPE. You are correct. It is not definitive. I think that the point you have raised in this paragraph is one that, if we spent about 2 or 3 minutes on it, would demonstrate the general character of the scientific problem in this field. With the chairman's permission, could I address myself to this question and in doing so provide this paper. I don't intend to go into this in technical detail, but simply to give you a feeling for what the nature of the problem is.

#### BACKGROUND OF RESEARCH ON TRANSMISSION OF THERMAL RADIATION

Now, the subject of discussion is the transmission of radiation through the atmosphere and we have here a chart in which the transmission factor (some fraction of unity which would mean it would be totally transmitted indefinitely) is plotted against distance, for visibility of 10 miles, which is the average visibility in metropolitan areas. This graph is taken from "Ignition of Materials by Large Yield Nuclear Weapons for Various Burst Heights and Atmospheric Conditions" by J. C. Rogers of Stanford Research Institute, dated May 1963.

Now, let me describe what is on this graph and describe the situation.

The earliest information available in 1951 was data gathered at small yield weapons in Nevada by Stewart & Curcio, represented by the upper lines on this graph labeled Stewart & Curcio.

For many years this was the only data available. It was gathered with the equipment at that time, much of which is primitive compared to today's technical standards. About 1955 additional data was gathered by Gibbons of NRDL. That is the lower line sweeping down here, labeled Gibbons.

Again for many years we had these two sets of data. They disagreed violently. The Stewart & Curcio data says that much of the energy is transmitted at a distance of say 10 miles, at least half of it or more, whereas Gibbons data suggested that very little of it would be transmitted at that distance.

Since these were empirical measurements, there being no theory by which to judge which might be more correct than the other, the decision was made to be conservative and the "Effects of Nuclear Weapons" line is as shown there; it leans a little bit toward Gibbons, but it mainly reflects the Stewart & Curcio data.

In 1960, Chin and Churchill of the University of Michigan developed a theoretical basis for this problem of transmission of thermal radiation in the atmosphere and a check of that theory tended to support the Gibbons data rather than the Stewart & Curcio data.

In 1962, just a year ago, Cahill, Ganvin, and Johnson of the Air Force Cambridge Research Laboratories up in Massachusetts developed a more detailed theory. It is described in the curve here labeled C. G. & J., and it again supports the Gibbons data.

If you were just looking at this from a technical point of view, you would say at this time that the weight of evidence is in favor of the Gibbons data and the theory that supports it.

The fact is that, as I said in my testimony, the Department of Defense is not yet prepared to make that drastic change which would further reduce the extent of the problem. The work is going on to attempt to substantiate this further, but I say that the results either will leave the data where it is or move it lower. I simply leave it to the judgment that the difference could be a large one. I am sorry but it is usually the case in science that almost never can you be certain. This is the material behind that particular paragraph. It is representative of the sorts of things that we must deal with in this area.

Mr. BECKER. This is the very point I was trying to make in my statement, Doctor. Here you have got four, Stewart & Curcio, "Effect of Nuclear Weapons," C.G. & J., and you have Gibbons.

This seems to be wide apart here. Are they experts in this field?

Dr. STROPE. These are workers in the field, that is right.

Mr. BECKER. Workers in the field, yet they are far apart. Why is one to conclude that Dr. Schreiber isn't just as wide apart as these two?

Dr. STROPE. In this particular area we are still using the same information that Dr. Schreiber is using, "Effects of Nuclear Weapons," but what I am warning is that the situation is not like that, that there is a strong possibility there may further be a change.

Mr. BECKER. So that at the present moment with this chart, with the statement of Dr. Schreiber, with yourself, there is a great deal of speculation in this field.

Dr. STROPE. This is not speculation; this is primarily two sets of data, one supported at the current time by theory and the other not.

Mr. BECKER. One supported by theory and the other not, but they are just as far apart.

Dr. STROPE. That is right. The two sets of data convey quite different conclusions.

#### SECRETARY OF DEFENSE M'NAMARA'S POSITION ON CIVIL DEFENSE

Mr. BECKER. Now, I would like to ask this question, Doctor, if I might: You say on page 8:

The position advanced by the Department of Defense is that an effective system of fallout shelters is an essential element of any reasonable civil defense effort and that there are low-cost ways of achieving this essential protection.

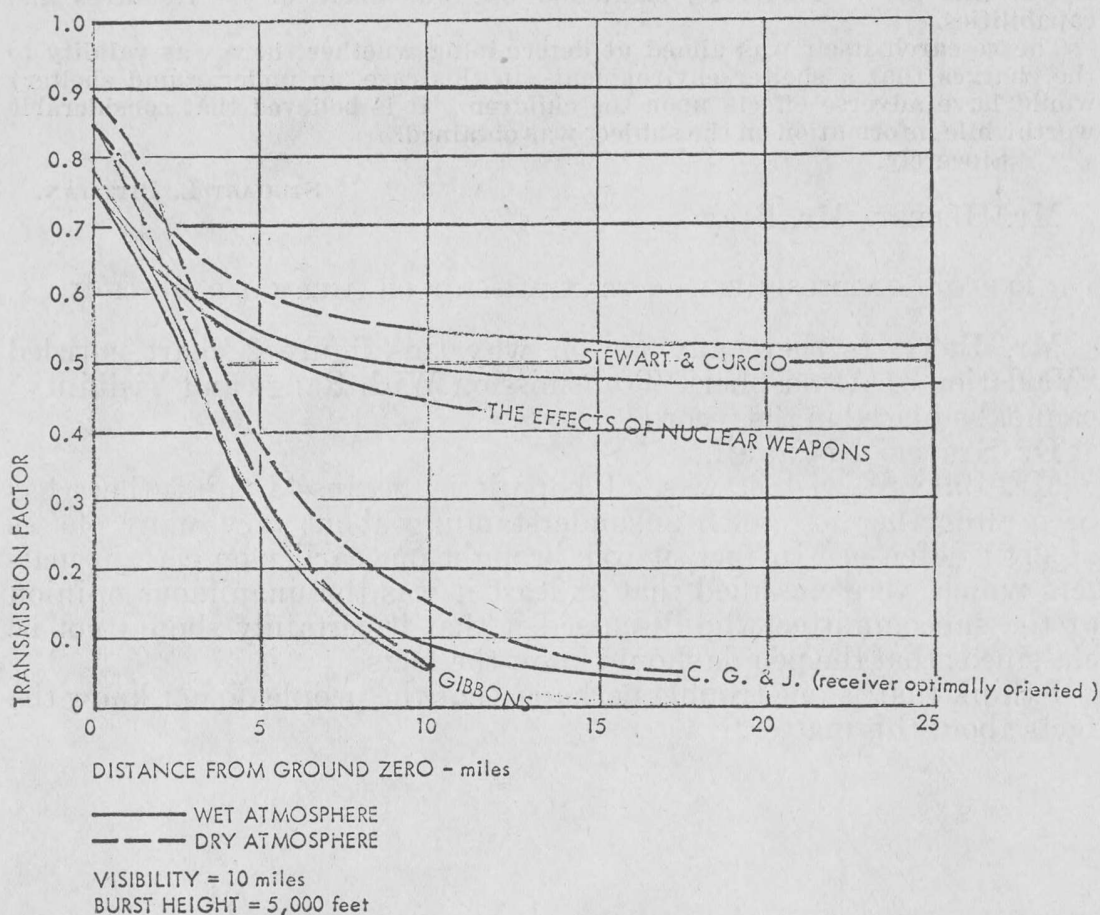
Now, when did the Department of Defense arrive at that conclusion, because it wasn't a conclusion a year and a half ago of the Defense Department. When did they arrive at this conclusion?



(The chart referred to follows:)

FIGURE 2

VARIATION OF ATMOSPHERIC TRANSMISSION  
WITH RANGE AND VISIBILITY  
COMPARISON OF COMPUTATIONAL TECHNIQUES  
(Receiver normal to radius vector)



#### DR. SCHREIBER'S CONCLUSIONS

Mr. BRAY. Also, since you were mentioning it, there has been quite a bit of testimony here as to the previous testimony of Dr. Schreiber.

As I recall, while there are certain fundamental differences in scientific conclusions made by Dr. Schreiber and by yourself, yet as I recall, the principal difference in the testimony is that he had determined in his own mind that they would make airbursts and not surface bursts, isn't that correct?

Dr. STROPE. More precisely, high-altitude bursts rather than low airbursts.

Mr. BRAY. That is right. High-altitude instead of the lower bursts.

Dr. STROPE. That is correct.

Mr. BRAY. And most of his conclusions were based upon that premise, which if he was right, at least some of his conclusions would be correct; if he is wrong, they certainly would not be correct.

JULY 1963

# FALLOUT SHELTER EFFECTIVENESS THE U.S. CIVIL DEFENSE PROGRAM



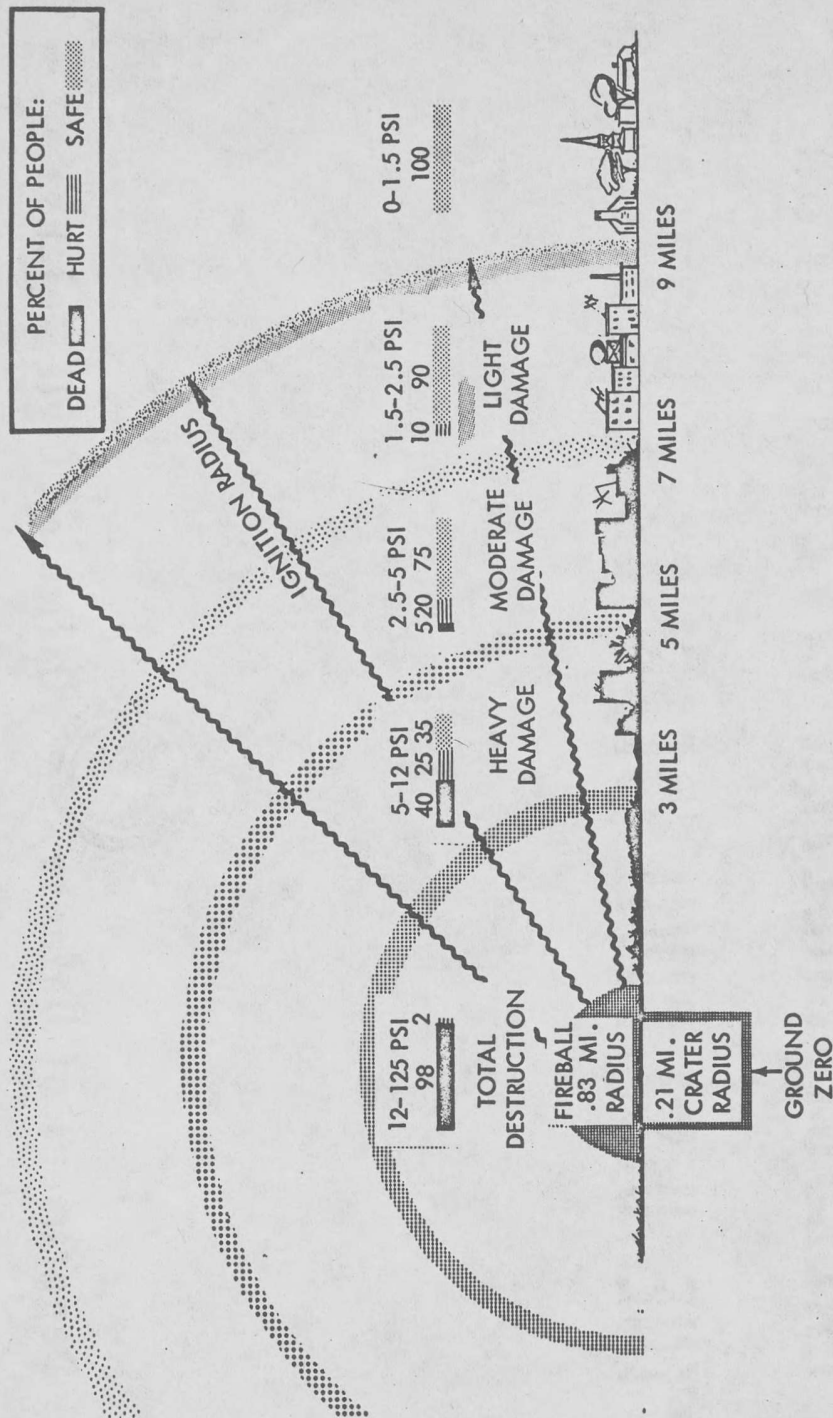
Department of Defense

Office of Civil Defense





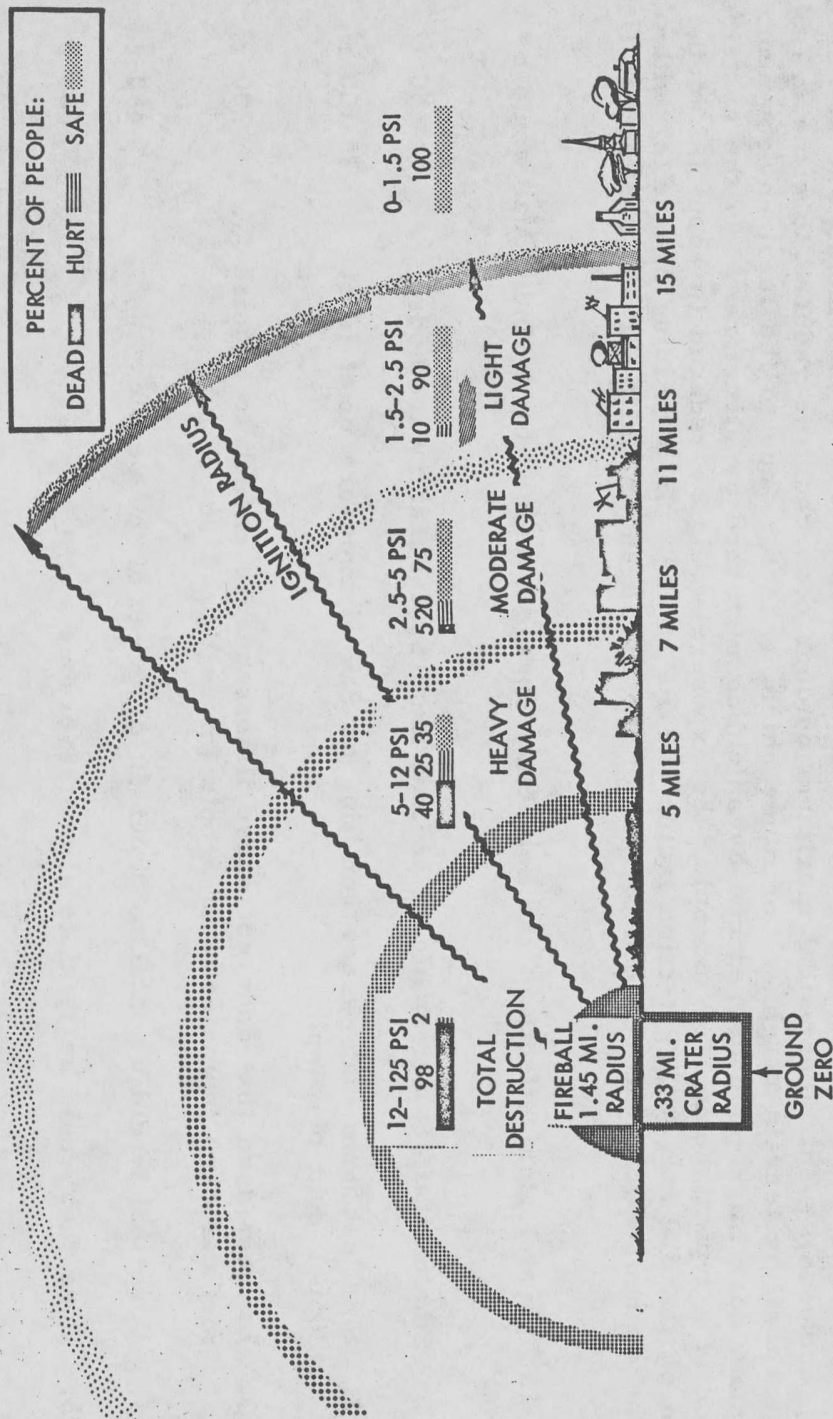
# EFFECTS OF A 5 MT BLAST



If burst is elevated to altitude maximizing reach of blast damage:  
 "Moderate Damage" from blast is extended from 7 to 11 miles  
 "Ignition Radius" (ignites newspaper) is extended from 9 to 10 miles

Chart 1

# EFFECTS OF A 20 MT BLAST



If burst is elevated to altitude maximizing reach of blast damage:  
 "Moderate Damage" from blast is extended from 11 to 17 miles  
 "Ignition Radius" (ignites newspaper) is extended from 15 to 17 miles

Chart 2



## EFFECTS OF RADIATION DOSAGE

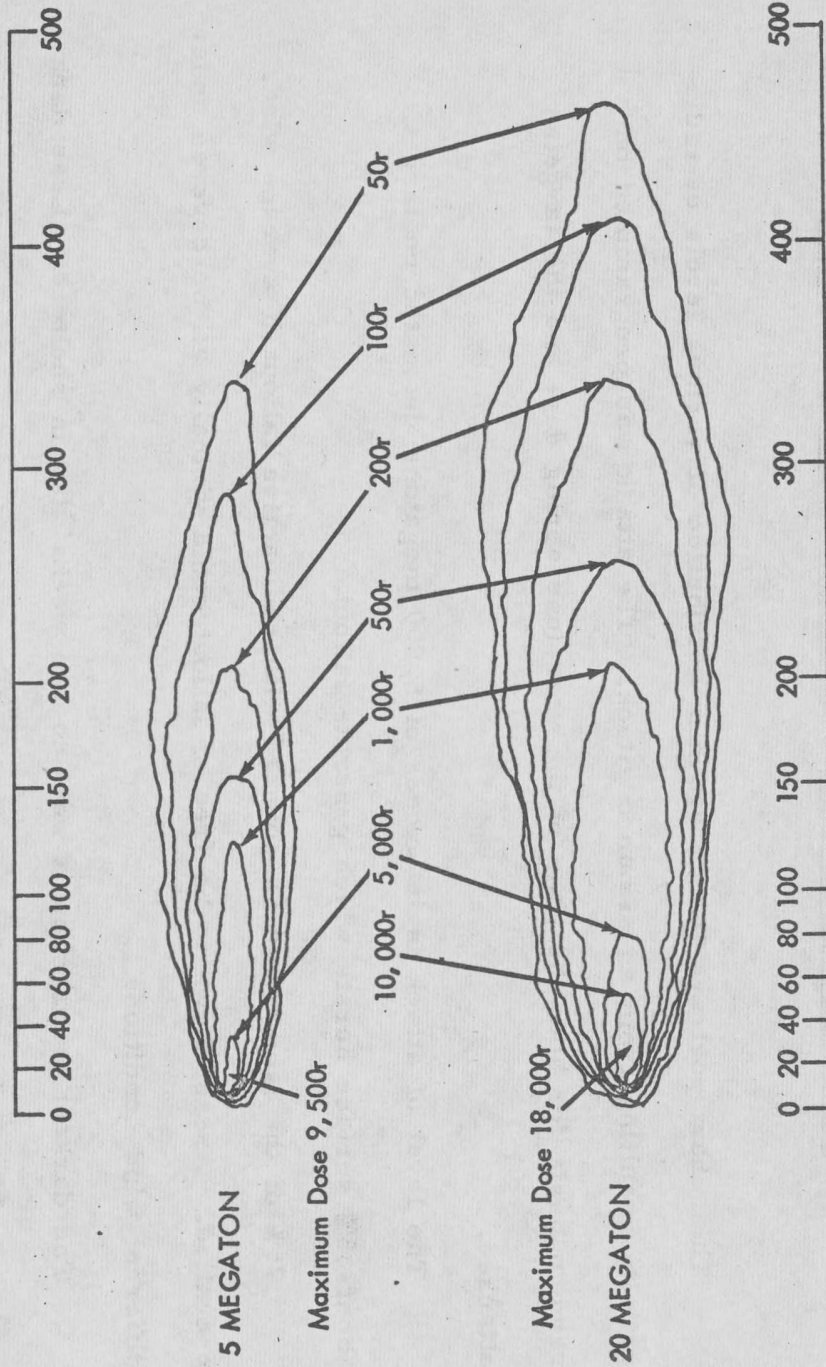
At the right are typical patterns for fallout which might be deposited by 5 and 20 megaton surface bursts. The contours show theoretical maximum doses to individuals who are unshielded (i.e., outdoors). This theoretical maximum outdoor dose could be reduced to some 0.7 of the values shown by terrain roughness or other shielding factors due to the local environment. The maximum dose might also be reduced by shielding furnished by structures. In the upstairs portion of a typical home, for example, the exposure would be reduced to about 1/2 of the value shown on the diagram (a "protection factor" or PF of 2.). In a building or shelter with a PF of 40, the exposure would be reduced to 1/40 of the figure shown, in a PF 100 shelter, to 1/100, and so on.

The physiological effects of the net actual dosage received by an individual would be as follows:\*

- |   |          |
|---|----------|
| 1. Smallest effect detectable in an individual by laboratory methods  | 50 r     |
| 2. Smallest dose that causes vomiting on day of exposure in at least 10 per cent of people                                      | 75-100 r |
| 3. Largest dose that does not cause illness severe enough to require medical care in majority of people (more than 9 out of 10) | 200 r    |
| 4. Dose that would be fatal to about 50 per cent of the people  | 450 r    |
| 5. Dose that would be fatal to almost everyone  | 600 r    |

\*The contours and the table of physiological effects are based on the "Equivalent Radiation Dose," or ERD, which takes into account the biological repair of radiation damage which the body can effect if the dosage is received over a period of time.

UNSHIELDED MAXIMUM EQUIVALENT RADIATION DOSE CONTOURS  
 50% Fission - 50% Fusion  
 Average Wind Speed ( 25 mph )



### FALLOUT CONDITIONS -- RANDOM ASSUMED ATTACK

This chart portrays the geographic distribution of various levels of radioactivity resulting from an assumed attack. The attack was programmed on a random basis for both the time of the year (one spring day) and the targets attacked.

The level of attack is in excess of 5,000 megatons detonated on target, about 65% surface bursts which generate fallout.

75% of the land would be covered with radioactive fallout if average winds prevailed. Areas shown to be free of fallout could virtually all be covered under different wind conditions.

The darkest areas show a week to two weeks stay in shelters. Less dark areas would require two days to one week. The light gray areas would require shelter only for the first day or two.



**FALLOUT CONDITIONS FROM A RANDOM ASSUMED ATTACK AGAINST A  
WIDE RANGE OF TARGETS: MILITARY, INDUSTRIAL AND POPULATION**

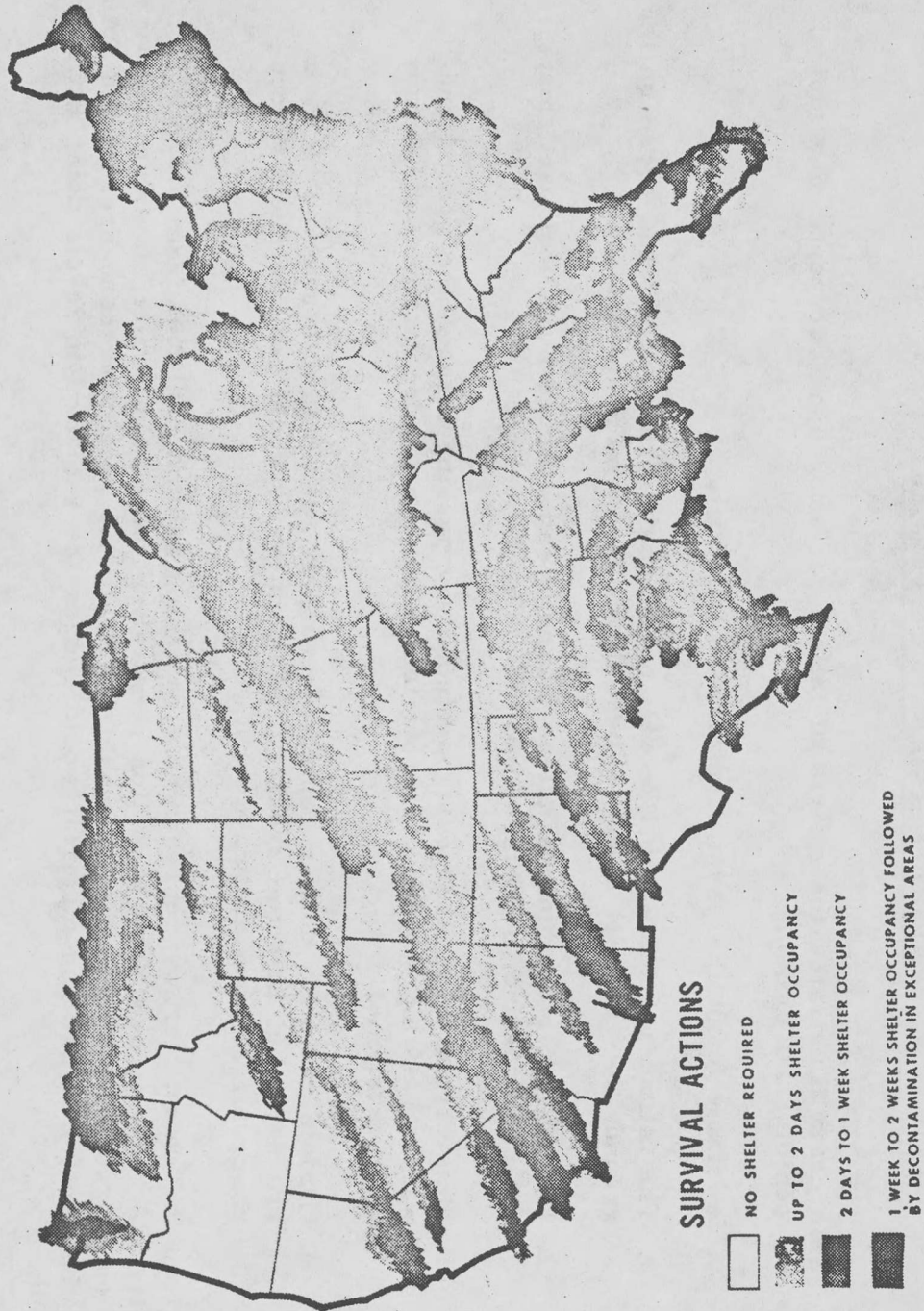


Chart 4

### FALLOUT RADIATION EFFECTS

This chart illustrates the effects of fallout radiation upon occupants of a typical 10-story commercial building.

A few facts about the physical nature of fallout:

1. The fallout particles are like salt or sand; they have weight and settle on the ground; they are not likely to be indoors in harmful amounts.
2. Food is not contaminated unless outdoors and covered by fallout particles; the particles can be removed by washing or peeling.
3. Water from many sources is protected by passing through the ground and by water purifying systems; unprotected water can be decontaminated in many water systems.
4. Gamma radiation decays rapidly -- roughly to 10% in 7 hours and to 1% in two days; but in some areas radiation intensity could require shelter occupancy for as long as two weeks.

In the chart, arrows represent the damaging gamma radiation from fallout particles. The arrows show radiation penetrating the outside walls, injuring persons in the outer rooms. Some radiation would penetrate the protective core area of the building, but the density of building material would reduce the radiation to levels doing little or no harm.

To the right of the building are pictured the initial effects of too much radiation on the human body; destruction of body cells is taking place soon to result in intense illness. Depending on the amount of the dose, death could follow days or weeks later. However, the same radiation is shown passing through food without contamination or damage.



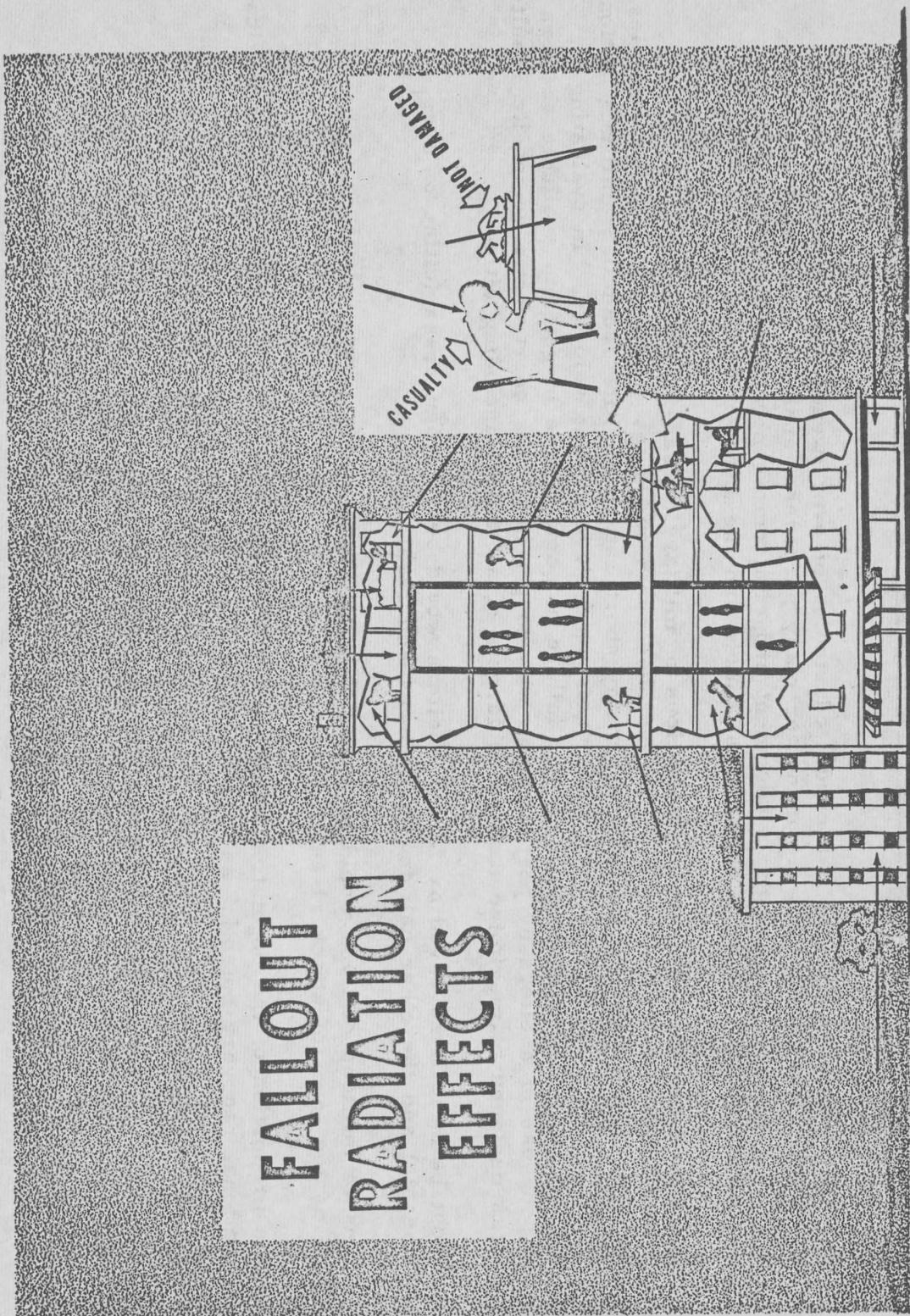


Chart 5



### LIFESAVING POTENTIAL OF NATIONWIDE FALLOUT SHELTER SYSTEM

The Department of Defense has conducted studies of over twenty attack patterns over the last two years. These studies were made for many purposes: analysis of military strategy, evaluation of new weapons systems development and civil emergency planning. The targeting was done principally by the Staff of the Joint Chiefs and the Defense Atomic Support Agency.

The attacks covered different combinations of military, urban-industrial and population targets with various mixes of airbursts and groundbursts and sizes of weapons. Other variables included such matters as how war starts, enemy abort rates, attrition from U.S. military action, duration of attack, weapons accuracy, and upper wind direction and velocity. In evaluating shelter potential, allowances were made for failure of some people to get into available shelters and for poor use of shelters by part of those who do get in. This chart shows composite results for attacks designed to maximize damage to targets of all types, including cities.

About half the lives saved by fallout shelters would be in urban areas (cities of over 50,000 people) and the other half in small towns and rural areas.

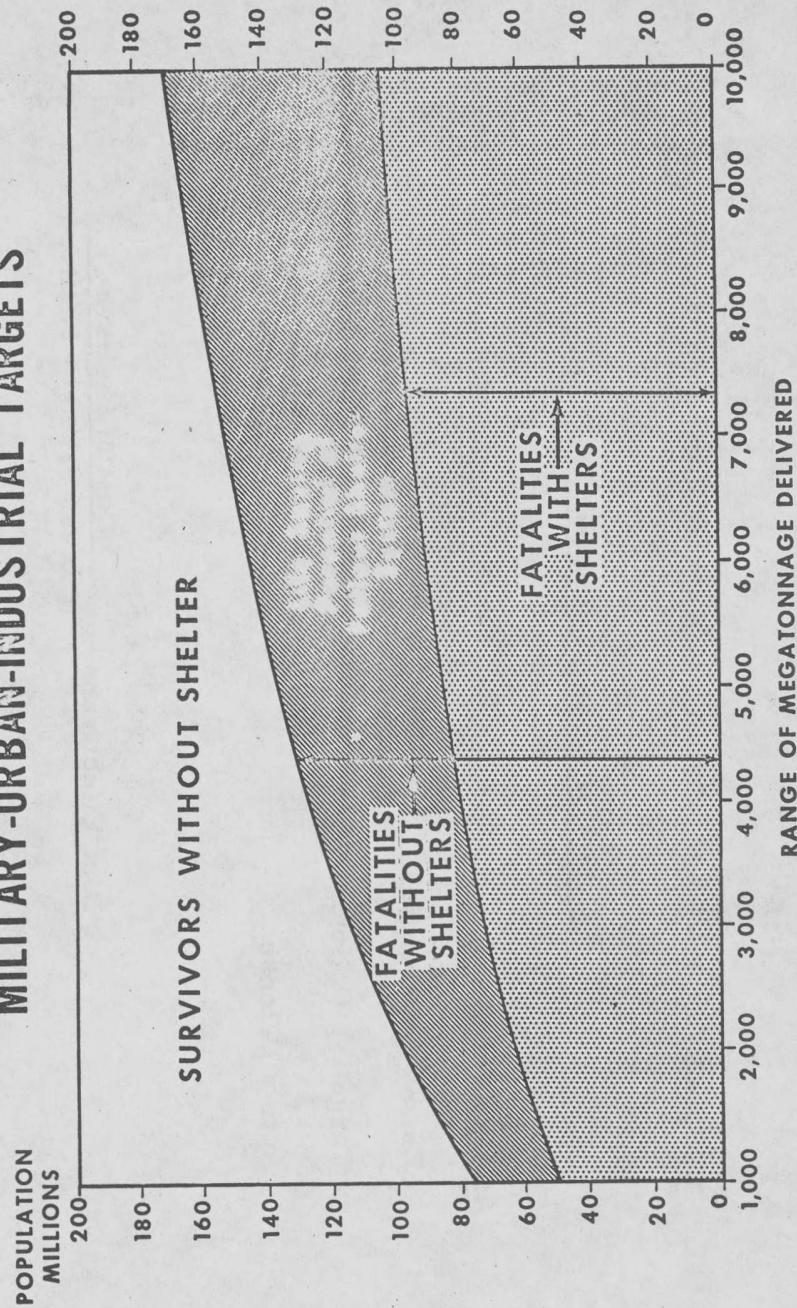
Tens of millions of lives would be saved by a full fallout shelter system; lives saved increase as the level of attack rises.

The proportion of the population surviving solely because of fallout shelters becomes critical to the national recovery potential as attacks become heavier:

Shelters almost double survivors at the middle of the chart (60 million survivors increased to 110 million).

Shelters more than treble survivors at the right of the chart (30 million survivors increased to 100 million).

**LIFE SAVING POTENTIAL  
OF  
FALLOUT SHELTER SYSTEM  
IN ATTACKS AGAINST  
MILITARY-URBAN-INDUSTRIAL TARGETS**



In event of attacks against military targets alone, total fatalities would be reduced and life saving potential of shelters would be increased.

SOURCE: Composite of damage assessment studies by Department of Defense

Chart 6

COST EFFECTIVENESS OF ALTERNATIVE SHELTER POSTURES

Cost Effectiveness Relates:

<u>Attack Conditions</u>	To	<u>Shelter Potential</u>
Enemy Capabilities		Fallout Protection
Targeting Options		Blast Protection
Active Defense		Distribution of Shelters

$$\text{Cost Effectiveness} = \frac{\text{Cost of Shelters}}{\text{Lives Saved by Shelters}}$$



GENERAL ASSUMPTIONS FOR COST-EFFECTIVENESS STUDY

<u>Median Level of Attack</u>	<u>With and Without Ballistic Missile Defense</u>
In excess of 5000 MT delivered	Representative ballistic missile defense system characteristics:
65% surface burst	22 cities protected*
	\$18 billion 5-year cost*
<u>Mixed Military and Urban Industrial Targets</u>	<u>Three Shelter Postures</u>
Offensive airfields	No shelter
Submarine bases	Full fallout shelter program (240 million fallout shelter spaces)
ICBM sites	Full fallout plus blast** (100 million fallout shelter spaces; 130 million blast shelter spaces)
Nuclear storage	
Military control centers	
Defensive bases	**100 largest metropolitan areas protected, plus centers near retaliatory targets (30 psi blast shelters in central areas of cities; 10 psi in suburbs.)
Seats of government	
Urban-industrial concentrations	

\*These figures as used here and in the following pages are arbitrarily selected median of various studies of hypothetical ABM systems ranging from 20 to 25 cities defended and costs of \$16 to \$20 billion.

# SHELTER ASSUMPTIONS FOR COST-EFFECTIVENESS STUDY

Some people will not take shelter.

- 10% of population fail to use available shelter.

Many people will make poor use of shelters.

- Measure of average shelter protection discounted.

Increasing population shift to urban areas.

- 18% shift by end of decade.

Shelters for daytime and nighttime population.

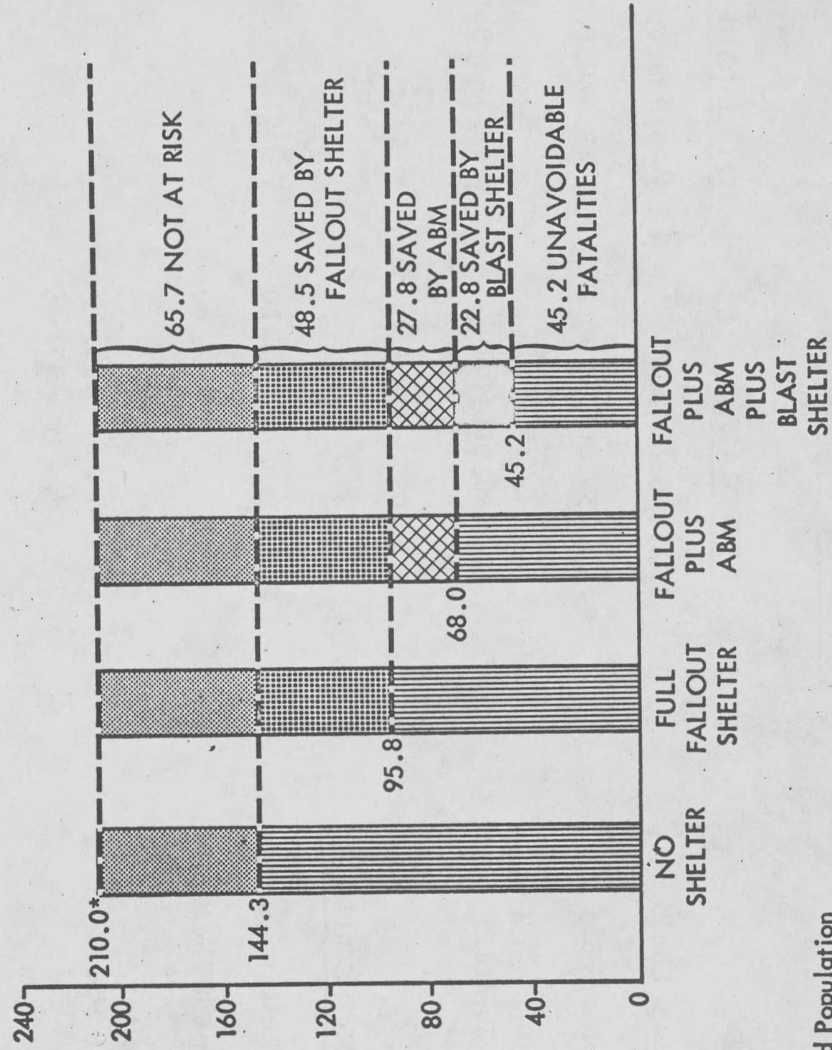
- 15% additional shelters required.

Certain factors not included for lack of adequate data offset each other:

- Blast protection afforded by fallout shelters, buildings, terrain and other local characteristics.
- Fatalities from fire spread beyond the impact area.

# LIFESAVING POTENTIAL

(Millions of People)



\*Projected Population  
for 1968-1970

Chart 7



SHELTER COSTS\*

<u>GROSS COSTS</u>	<u>FEDERAL</u>	<u>TOTAL (GNP)</u>	
Full Fallout Shelter	\$ 2,350,000,000	\$ 5,820,000,000	
Fallout plus ABM	20,350,000,000	23,820,000,000	
Fallout plus ABM plus Blast Shelters	36,750,000,000	41,165,000,000	
<u>AVERAGE UNIT COSTS</u>			
Survey Shelter	\$	1.20	\$ 1.20
Development Shelter		22.40	37.70
Blast Shelter			
10 PSI		125.00	136.00
30 PSI		146.00	177.00

\*Exclusive of shelter supplies

COST EFFECTIVENESS

	FEDERAL		TOTAL (GNP)	
	Average	Cost per Life Saved Incremental *	Average	Cost per Life Saved Incremental *
Continuing Survey	\$ 4	\$ 4	\$ 4	\$ 4
Full Fallout Shelter	48	104	120	264
Fallout plus ABM	267	647	312	647
Fallout plus ABM plus Blast Shelter	371	719	415	761

\*Added cost divided by added lives saved. Thus for the "Fallout plus ABM" system, \$647 equals the additional cost of the ABM system (over a fallout shelter system) divided by the additional lives saved.

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MAY 14, 1963.

HON. CARL VINSON,  
Member of Congress, House Office Building,  
Washington, D.C.

MY DEAR CONGRESSMAN: Reference is had to H.R. 3516 which is before the subcommittee of the Armed Services Committee of the House of Representatives introduced by the chairman of that subcommittee. This is to advise you the civil defense shelter program has been endorsed by the Veterans of Foreign Wars in support of a strong national civil defense program.

In line with this endorsement the Department of New Jersey, Veterans of Foreign Wars, asks that every consideration be given for this bill and it may be enacted into law.

Thanking you for your many past courtesies, I am,  
Respectfully yours,

BENJ. P. THOMAS,  
Adjutant-Quartermaster, By Direction, Veterans of Foreign Wars of the  
United States, Department of New Jersey.

MAY 16, 1963.

HON. CARL VINSON,  
Member of Congress, Chairman, House Armed Services Committee,  
House Office Building, Washington, D.C.

DEAR CONGRESSMAN VINSON: The Veterans of Foreign Wars of the United States are vitally interested in a strong national civil defense program and we are mandated by convention to urge Congress to take such action as would accomplish this objective.

In addition to the convention mandate, the National Legislative Committee together with the commander in chief has established a strong national civil defense program as a key objective for 1963.

Anything you could do to further the passage of H.R. 3516 would be very much appreciated by the members of our organization.

Sincerely,

NATIONAL LEGISLATIVE COMMITTEE,  
ARTHUR H. TYRON, Chairman,  
Veterans of Foreign Wars of the United States.